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CUMULATIVE ASSESSMENT REPORT
ROBERTS MOUNTAIN REGION

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CHAPTER I

EXECUTIVE SUMMARY

The CEQ defines cumulative impacts as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably forseeable future actions regardless of what agency (Federal of non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over period of time." As a result of this concern and mandate a cumulative report has been prepared for the 250,000 acre Roberts Mountains Region in the Shoshone-Eureka Resource Area of the Battle Mountain, Nevada Bureau of Land Management District Office. A total of 12 mining companies have some involvement in the region. Ten have sponsored this report. Presently only two have active mines in the region. All have had either Proposed Plans of Operation or Notices of Intent to explore or mine within the region.

This report looks at 15 different elements of the environment that have been impacted and 2 other activities that are ancillary to the mining operations (transportation and powerline distribution) and a final category to include other mineral activities. These include the following: vegetation, other mineral activities (apart from metal mining, e.g., materials pits, oil and gas, barite, etc.), soils, paleontology, range management, wild horses, wildlife, threatened and endangered species, forestry, wilderness, riparian, air resources, visual resources, water resources, socioeconomics, transportation, powerline distribution, cultural resources and recreation. Impacts have occurred at various levels and intensities within the region. Each element of concern has been rated within a Cumulative Effects Score (CES) designed to quantify the relative level and intensity of the cumulative effects. Various interactions have been discussed and documented but only with available data bases.

Environmental elements impacted the most have been vegetation, range management, wildlife, water resources, riparian socioeconomics and cultural resources. Other elements have either been impacted at an intermediate level (recreation, forestry, and threatened and endangered species) or impacted only slightly or not at all (wilderness, soils, paleontology, air resources, visual resources, wild horses). Other mineral resources, powerline distribution and transportation are all involved in or influence cumulative impact.

Future impacts must be assessed in future. Decisions as to management changes should be based on monitoring data and levels of impact that can be identified and quantified and the level of influence described in relation ot all resources in the region.

INTRODUCTION

The Roberts Mountains Region and surrounding areas are public lands administered by the Bureau of Land Management, Battle Mountain District, Shoshone-Eureka Resource Area (BLM). The area contains approximately 250,000 acres in which twelve mining companies have either submitted or planned to submit proposed Plans of Operation or Notices of Intent for potential mining operations. Ten of these companies have entered into an agreement to have this Cumulative Assessment Report written. The purpose of the report is to satisfy legal requirements for consideration of cumulative effects to the lands and resources in the area. The National Environmental Policy Act (NEPA) and several other acts require a consideration of the cumulative effects of numerous projects all collectively impacting a land area or region. To satisfy the requirements the BLM must complete and analysis of cumulative impacts, either during the NEPA process (EA, EIS) or as a separate action.

The council on Environmental Quality (CEQ) stated in 1978 that an EIS must consider 1)Direct Impacts, 2) Indirect Impacts, and 3) Cumulative Impacts. Furthermore, CEQ defines cumulative impacts as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably forseeable future actions regardless of what agency (Federal or Non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time." The terms "impacts", "effects", and "changes" as used in these regulations are synonymous.

Over the last several years, the BLM has seen substantial increases in exploration and mining activities in the Roberts Mountains Region. The impact of this exploration and mining to date, by themselves, is very small, but when all projects are considered simultaneously, there may be substantially different affects to resources than those identified on a case-by-case basis.

This report, in effect, is describing a history of natural (where important) and human-caused disturbances, including direct and indirect effects of the mining companies in the region. This effort has been designed to update the existing knowledge of impacts on resources in the entire region by the various mining companies involved and to, insofar as possible from existing data and information, describe the cumulative impacts. The following 15 elements will be looked at in this regard: vegetation, soils, paleontology, range management, wild horses, wildlife, threatened/endangered species, forestry, wilderness, riparian condition, air resources, visual resources, water resources, socioeconomics, cultural resources and recreation. Other mineral resources, powerline distribution and transportation are also considered separately in order to evaluate all possible effects with in the region.

The Roberts Mountains Region is dominated by pinyon/juniper and mountain big sagebrush at higher elevations, and big sagebrush, Wyoming big sagebrush and salt desert shrub species at lower elevations. It is located in Central Nevada and consists of the Roberts Mountain range, a portion of the Simpson Park Mountains and part of the surrounding valleys. The region considered in this report is the area within the boundaries of the J.D. Alpha Road to the north, State Highway 291 to the east, the 3-bar Ranch Road to the west, and the southern limits of the 3-Bar Creek and Roberts Creek Allotments to the south. The regions covers approximately 250,000 acres.

The soils in the area are broken up into two general areas; the mountain area and the high mountain area. Erosion hazards are moderate and conditions are favorable for a variety of shrub and plant species.

The Roberts Mountains Region is characterized climatically by hot summers averaging approximately 80 to 88 degrees maximum in the day, and cold winters averaging between 17 and 20 degrees minimum for the day. At the lower elevations precipitation is light all year, while at the higher elevations it is much heavier. Substantial snow packs accumulate during winter and provide run-off in the summer, much of which is used for irrigation in some of the nearby valleys.

CHAPTER II MINING AND EXPLORATION

REGIONAL GEOLOGY OF THE ROBERTS MOUNTAINS REGION

The Roberts Mountains are formed by an eastward-tilted fault block within the Basin and Range Physiographic Province (Roberts, et al., 1967). Rocks consist of lower Paleozoic sedimentary rocks and some Tertiary volcanic rocks consisting primarily of basalts and lava flows. Thick basaltic dikes and sills were emplaced along major structures in Mesozoic or early Tertiary time.

The Roberts Mountain Thrust, a major compressional, structural feature in the area, was active in Late Devonian to Mississippian time during the Antler Orogeny. A thrust sheet of older Paleozoic eastern assemblage rocks consisting of cherts, shales, sandstones, limestones and massive volcanic breccias deposited in a deep marine environment were placed over younger Paleozoic western assemblage rocks composed of carbonate and clastic rocks deposited in a broad continental shelf environment (McKee et al., 1986). Mineralization associated with north to northwest trending high-angle faulting and the low-angle Roberts Mountains Thrust is confined mainly within the lower carbonate rocks.

Mineralization of the carbonate-hosted orebodies lies within a major belt associated with the Roberts Mountain Thrust. Two types of mineralization are present. Gold and silver occurring in dolomite of the western assemblage carbonates beneath the Roberts Mountain thrust sheet has the greatest potential. Hydrothermally deposited gold-silver-lead-zinc--bearing calcite and quartz veins along fault and shear zones constitute a second type of mineralization present.

STATUS OF EXISTING AND PROPOSED MINING AND EXPLORATION ACTIVITY

This Cumulative Analysis Report (CAR) has been prepared to address all current minerals-related activity and those planned for the immediate future in the Roberts Mountains. The boundaries defined by the CAR are within the regional setting of the Roberts Mountains which lie in the Eureka mining district. Mining companies with claims located within the specified CAR boundaries include ASARCO, Atlas, Gexa, Hycroft, NERCO, Pegasus, Phelps-Dodge, Santa Fe, U.S. Borax, and U.S. Gold/Silver State Mining Company. These ten companies comprise the CAR group.

Exxon, Molycorp, Inc., and Taseko also have claims located within the CAR boundaries, but currently are not participating in the CAR group.

The mineral potential of the Roberts Mountains area is high and is presently the focus of precious metals exploration and development by several mining companies. Two active mines are presently extracting precious metals (gold and silver) from the Roberts Mountains area; the Gold Bar mine operated by Atlas Minerals Division (Atlas) and the Tonkin Springs Mine operated by U.S. Gold/Silver State. The remaining companies are involved in precious metals exploration activities of varying extents as summarized below.

SURFACE DISTURBANCE

Most of the existing surface disturbance in the Roberts Mountains area is a direct result of mining-related activities. The main areas of existing and proposed surface disturbance for each mining company's claim block group are shown on Map A. The map reflects only areas of large surface and proposed disturbance. Smaller areas of disturbance and potential disturbance are included in the acreage total (Table 1) but are not indicated on the map due to the small scale.

A summary of proposed, existing and authorized surface disturbance for each mining company is shown in Table 1. Total cumulative surface disturbance in the Roberts Mountains is 925 acres and proposed surface disturbance is 845 acres. Atlas accounts for 62 percent and U.S. Gold/Silver State accounts for 29 percent of the total existing disturbance. Exploration activities of the other companies account for the remaining 9% of total surface disturbance.

TABLE 1: CLASSIFICATION OF SURFACE DISTURBANCE (ACRES)

MINING COMPANY	PROPOSED	EXISTING	AUTHORIZED	REMAINING	RECLAIMED
ASARCO	3	12	12	0	2
ATLAS:					
Gold Bar	0	426	426	0	0
Gold Bar II	817	150	325	175	2
EXXON	0	5	5	0	0
GEXA	0	10	10	0	2
HYCROFT	0.6	10	5	-5	5
MOLYCORP	0	3	3	0	0
NERCO	13.3	22	15.76	-6.24	1
PEGASUS	0	7	7	0	2
PHELPS-DODGE	12	7	5	-2	1
SANTA FE	0	7	5	-2	0
U.S. Gold/Silver State:					
N. Tonkin	0	37	182	145	0
S. Tonkin	0	207	414	207	0
Tonkin Man Camp	0	20	20	0	0
U.S.BORAX	0	2	2	0	0
TOTAL:	845.3	925	1,436.76	527	15

EXPLORATION AND MINING ACTIVITIES

ASARCO:

ASARCO claims encompass the periphery of the Roberts Mountain WSA boundary shown on the Roberts Creek Mountain, Nv. 1:62,500 quadrangle. The majority of exploration activity is located in T.23N., R.50E. and T.24N., R.50E. and consists of drill holes and roads. Total land disturbance is 10 acres. Approximately 100 holes have been drilled in the last 4 years. Both dry and wet drilling methods are used. Water used for drilling is obtained from Roberts Creek at a rate of 2,000 gallons per field season. All drill holes (approximately 15 holes) in the WSA boundary have been reclaimed (cemented, recontoured, and reseeded). Most of the other drill holes are reclaimed as soon as the drill rig leaves. Roads have not been reclaimed. ASARCO has had two separate mining exploration ventures within the WSA boundaries, both which have undergone total reclamation.

1989 proposed activities: Mapping, sampling and drilling of approximately 20 holes located on the east side and outside of the Roberts Mountains WSA boundary. This will result in 3 acres of disturbance.

ATLAS:

Atlas claim blocks are located on the Roberts Creek Mountain, Nv. and Garden Valley, Nv. 1:62,550 quadrangle and cover 75 square miles. Atlas operates the Gold Bar mine and processing plants located at the south end of the Roberts Mountains 30 miles northwest of Eureka, Nevada in Sections 22,23,26, and 27, T.22N., R.49E. Atlas is also conducting exploration activities in the Gold Bar II area located in T.22N., R.50E., and T.23N., R.50E. This exploration has led to three gold discoveries in this area (collectively referred to as the Satellite project). Atlas has proposed a surface disturbance of 1,500 acres for the Satellite project.

GOLD BAR PROJECT:

The Gold Bar mine, an operating open pit gold mine and mill, began operation in January of 1987. The mill processes 3,000 tons of ore per day and operates 24 hours per day and 365 days per year. The Gold Bar mine has resulted in a surface disturbance of 410 acres (waste dumps and topsoil stockpiles (85), open pit mine (65), leach pads and ponds (35), tailings disposal and construction borrow area (220), offices, plant, shops (5)). Cyanide, used in one extraction, is stored on site at the mill located northwest of the open pit mine. The tailings pond, consisting of three cells, is located about 4,500 feet southwest of the mill.

GOLD BAR II PROJECT:

Atlas exploration activities in the Roberts Mountains area has led to three gold orebodies referred to as Goldstone, Gold Ridge, and Gold Pick. The three proposed open pits and ten adjacent waste rock dumps are collectively referred to as the Satellite project. The Satellite project is located primarily within the Roberts Creek drainage in unsurveyed T.22N., R.50E. and T.23N., R.50E. on the Roberts Creek Mountain, Nv. 1:62,500 quadrangle. This project has resulted in 125 acres of existing disturbance (Gold Pick 90; Goldstone 15; and Gold Ridge 20) and 817 acres of proposed disturbance. A 5.5 year mining life is expected with a removal of approximately 7,027,000 tons of ore.

Construction and operation of a haul road between the Satellite project and the Gold Bar mine site, construction and operation of a leach pad system along the haul road, expansion of the existing mill tailings pond, and the ancillary systems needed for support of these facilities have been proposed. The haul road would be approximately 9.3 miles long and 60 feet wide (150 acres surface disturbance) with an average grade of 5 percent. The haul road would originate at the mill and head east for about 5 miles along the southern base of the Roberts Mountains to the site of the proposed leach pad. From here, it would head north and ascend up the west slope of the Roberts Creek drainage to the proposed mining operations.

The proposed leach pad would be located along the haul road approximately 5 miles east of the present mill and would cover 20 to 40 acres. Mill-grade ore would be hauled to the existing mill which would continue to operate at the same 3000 tons per day production rate.

To date, Atlas has approximately 1,450 drill holes (Gold Bar 550; Gold Stone 200; Gold Ridge 225; Gold Pick 425; 90 holes east of 3 bar Ranch; and 50 holes other). Ten percent of the total area has been reclaimed. Water used for drilling purposes is collected from the well located at the Gold Bar mine and neighboring streams including Cottonwood Creek, Roberts Creek, and Bartine Ranch. Roads are constructed 12-15' wide and have a 12% to 15% grade. Water bars have been installed. Air quality is affected by localized fugative dust.

Under the existing plan of operation, the Gold Bar mine site would be reclaimed as soon after mining and milling is terminated as is practical. Surface disturbances in the Satellite site that are not scheduled for mining would be reclaimed.

1989 proposed activities: A considerable amount of road building and drilling is expected.

GEXA:

Gexa has two claim blocks located in T.23N., R.49E. and T.24N., R.50E. located on the Roberts Creek Mountain, Nv. 1:62,500 quadrangle. Claim blocks located in T.23N., R.49E. have been leased to Hycroft. A surface disturbance of ten acres from exploration is confined to this claim block (T.23N., R.49E.) and consists of two trenches approximately 300 feet in length. One air-drilled hole is located at each trench site. Both trenches have been filled and smoothed.

1989 proposed activities: Further exploration including possible trenching.

HYCROFT:

Hycroft claim blocks are located in T.23N., R.49E. on the Roberts Creek Mountain, Nv. 1:62,500 quadrangle. Hycroft is leasing the GEXA claim block (T.23N. R.49E.) located south of the Hycroft claims. Surface disturbance for these two claim blocks is estimated at 20 acres and consists of exploratory trenches, drill roads, and drill holes. Roads have been constructed with a 5-10% grade and 15 degree hillside slope. Water used for drilling is derived from the Tonkin Spring. Estimated water consumption is 500 gallons/day over a period of 20 days. Approximately sixty percent of the 20 acres have been reclaimed and reseeded.

1989 proposed activities: Exploratory drilling and additional road construction resulting in the disturbance of approximately .6 acres.

NERCO:

NERCO Minerals Company (NERCO) has a total of five mining claim blocks located on the southern flank of the Roberts Mountains; four are located within unsurveyed portions of T.22N., R.50E. and the fifth is located at T.22N., R.51E. on the Roberts Creek Mountain, Nv. 1:62,500 quadrangle. NERCO is also leasing two of the Pegasus claims located in unsurveyed T.22N., R.50E. and T.22N., R.51E. Pegasus conducted exploration activities on both claim blocks which consisted of exploration drilling and some surface disturbance associated with access to drill sites. This surface disturbance of five acres remains unclaimed.

Total surface disturbance is 27 acres with 22 acres located in NERCO claims and 5 acres in the Pegasus claims. Surface disturbance of 22 acres are confined to three claim blocks: the Hunter Claims just east of Roberts Creek in Sections 12, 13, of T22N, R50E and sections 7 and 18 of T.22N., R.51E. (4 acres disturbance); the Chev Claims near Rutabaga Creek in sections 21, 22, and 23 of T.22N., R.50E. and sections 5,8,9,16, and 17 of T.22N., R.50E. (9 acres disturbance); the SiSi claims in sections 2,3,10, and 11 of T.22N., R.50E (9 acres disturbance). The previous claimant of the SiSi claim block was Exxon. All surface disturbance by Exxon in this claim block has been reclaimed. A portion of the Chev claims were previously claimed by Chevron.

Surface disturbance from Chevron consisting of road and drill site construction has been partially reclaimed.

Exploration activities of NERCO consist of 25 drill holes and 7 trenches with a length of 40 feet and a width of 12 feet located in the Chev Claim block and construction of drill roads in the Hunter and SiSi claim blocks. Six of the trenches have been reclaimed (covered and reseeded). Ninety percent of drilling is dry. Water used in wet drilling is obtained from Roberts Creek at a rate of 10,000 gallons/year. Roads are 12 feet wide with a grade less than 10 percent.

A temporary man camp consisting of a 28 foot travel trailer is located on the south edge of the Hunter claims and will remain on the project site during drilling operations and be removed upon completion of the drilling program and during winter shutdown.

1989 proposed activities: NERCO proposes 13.3 acres of future road construction and 202 drill holes which will be completed by late fall of 1990. The SiSi claims will be the main focus of exploration with a planned drilling of 100 holes and construction of 7.2 acres of drill roads. The remaining 6.1 acres of proposed surface disturbance are as follows: Hunter 2.2; Pegasus claims 2.5; Keph .6; and Cotton .8. An anticipated 3,000 gallons of water per month obtained from Roberts Creek will be required for the proposed project. The project will employ a three-person drilling crew and one or two geologists. Employees will be based in Eureka or reside in a 28 foot travel trailer located in the Hunter project area.

PEGASUS:

Pegasus has three claim blocks; one located at T.23.5N., R.50E. and two located in T.22N., R.50E. Pegasus is in joint partnership with NERCO and claims are currently operated by NERCO. Exploration activity in the north claim near the WSA boundary consisted of drilling only (no access road or drill site construction was done). The holes in the north claim near the WSA boundary have been plugged and filled.

Thirteen holes have been drilled in the southern claims. Water used for drilling was obtained from Roberts Creek.

Approximately two miles of road at a width of 15 feet and a

10 percent grade have been constructed. Roads remain unclaimed for future use by NERCO.

1989 proposed activities: Pegasus is not doing any work at this time and has leased claims to NERCO for a period of one year.

PHELPS-DODGE:

The Phelps-Dodge claim block is located within unsurveyed portions of T.22N., R.50E. and T.23N., R.50E. on the Roberts Creek Mountain, Nv. 1:62,500 quadrangle. The seven acres of land disturbance consists of 35 drill holes and drill roads. Of these seven acres, approximately 5 acres of disturbance is from drill roads. Both wet and dry drilling methods are used. Water used for drilling is obtained from Cottonwood Canyon Creek. An estimated 20 to 50 gallons of water per drill hole is used from Cottonwood Canyon Creek. The majority of the drill holes are located in the southern part of the claim blocks and have been reclaimed by inserting posts and filling.

Four to five miles of drill roads with a width of 12 feet and a ten percent grade have been constructed. Most of the roads, located mainly in the southern claim blocks, have been reclaimed.

1989 proposed activities: Phelps-Dodge is planning 30 to 100 (maximum) drill holes and associated construction of a maximum of 28,500 linear feet (9.8 acres) of drill roads resulting in 12 acres of disturbed land. Phelps plans to conduct the drilling operation from early summer to late fall of 1989.

Disturbance will affect the upper portions of Rutabaga Creek, Cottonwood Creek, and an unnamed tributary drainage to Tonkin Spring Creek and result in increased erosion and sediment load. Approximately 2000 gallons of water taken from Cottonwood Creek will be used for drilling. The proposed project will employ four to five people housed in the nearest community, Eureka.

Upon completion of the drilling program, drill holes will be filled with drill cuttings and rocks, and capped with rocks if necessary. Disturbed areas will be reseeded and recontoured.

SANTA FE :

Santa Fe claims are located in the northeast part of the Bartine Ranch,Nv 1:62,500 quadrangle and in the Westley claims on the Roberts Creek Mountain, Nv. 1:62,500 quadrangle. Santa Fe is in joint ventureship with Westley. Surface disturbance of three acres in the Westley claims includes 4 exploratory drill holes. Surface disturbance in Sections 29,30, and 31 of T.22N. R.51E. totals five acres of drill holes and access roads. Both wet and dry drilling are performed. Water for drilling is obtained from the Eureka Highway Maintenance Dept.

1989 proposed activities: 16 more drill holes located just north of the existing drill holes in the Westley claim block are planned for this summer.

U.S. BORAX

The claim block for U.S. Borax is located in the unsurveyed T.23N., R.51E. on the Garden Valley, Nevada 1:62,500 quadrangle. Exploration consists of 9 drill holes and the construction of a 1.5 mile long access road resulting in 2 acres of surface disturbance. Water used for drilling purposes was obtained from Henderson Creek and purchased from the 3-Bar Ranch. Approximately 4,000 total gallons of water were used. Surface area disturbance currently remains unclaimed.

1989 proposed activities: A road paralleling the main fork of Frazier Creek and covering 3.5 acres and construction of two reservoirs along the creek were proposed in 1988, however, no further work is expected by U.S. Borax on these claims. The claims will either be dropped or sold. The Aerial Compliance Report (7/31/89) prepared by the Battle Mountain BLM indicated no observed exploration for 1989 to date.

U.S. GOLD/SILVER STATE MINING COMPANY:

The Tonkin Springs gold mines and processing facility are located forty air miles northwest of Eureka, Nevada in the Simpson Park Mountains. U.S. Gold/Silver State has two mining operations in the Simpson Park Mountains referred to as the North Tonkin project and the South Tonkin project. U.S. Gold/Silver State operates the Tonkin Springs Mine (South Tonkin project) located in Section 2 and 3 of T.23.5N., R.49E. and has been conducting mineral exploration (North Tonkin project) in Section 28 and 33 of T.24N., R.49E., two miles north of the Tonkin Springs Mine. Total existing surface disturbance between these two projects is 244 acres.

SOUTH TONKIN PROJECT

U.S. Gold/Silver State is currently mining gold and some silver from the Tonkin Springs mine located on the Roberts Creek Mountain, Nv. 1:62,500 quadrangle. Orebodies currently being exploited are hosted by thin-bedded carbonates of the lower Vinini Formation. Ore is also located in a chert-shale-siltstone sequence of the Vinini. A sulfide ore body lies beneath the oxide ore and has been exposed in several of the existing pits.

The Tonkin Springs mine processing facilities currently process only oxides by heap leaching methods. Sodium cyanide is stored on site in the processing plant for this process. A mill facility and tailings impoundment for processing the sulfide ore is currently being constructed east of the pit and south of the heap leach pad. The facility is expected to process about 2.5 million tons of gold/silver bearing rocks. Approximately 5 million tons of overburden or waste rock will have to be removed to reach the sulfide ore. All processing operations at the Tonkin Springs mine have ceased until construction of the mill is completed. Completion is estimated for late October of 1989 at which time processing will resume.

Authorized surface disturbance at the Tonkin Springs Mine totals 394 acres (waste dumps and ore stockpiles 150; open pits 100; leach pads and ponds 90; haulroads 12; offices, plants, crusher and shops 8; exploration drilling 10; development drilling 20; topsoil stockpiles 4), however, existing disturbance to date totals 207 acres.

Structures at the Tonkin Springs mine consist of 3 solution ponds, 1 leach pad, 1 tailings pond, and 1 seepage pond. The solution ponds and the seepage collection pond are lined with 60 mil, high density polyethylene and a 40 mil secondary liner. Seepage pond fluids are recycled or used in mill processing. Groundwater below the seepage ponds is monitored. Drainage control measures for pits are in the form of diversion channels. The tailings ponds have a compacted clay substrate with a 10-9 permeability factor. This exceeds the EPA requirements of 10-7. A diversion ditch encompasses tailings. A 400 gal/min well is being drilled. Estimated total water consumption is less than 400 gal/min.

A self contained bunk house man camp and a 40 unit RV park with a septic tank and well has disturbed 20 acres. The location of the camp and RV park is about 2 miles east of the Tonkin Springs mine site in the SW1/4 of Section 36, T.24N., R.49E. Both set-ups house mine employees and support construction activities currently underway at both the Tonkin Springs Mine and the North Tonkin project. The camp and RV park currently houses 100 construction workers on site. Water and power is generated on site. U.S. Gold/Silver State is planning to remove all structures and buildings after the 12-month construction period has ended, but is expected to retain the 40 RV set ups for future mine employees.

NORTH TONKIN PROJECT

The North Tonkin project (Rooster project) located north of the Tonkin Springs mine has an authorized disturbance of 182 acres (haulroads 17; North Tonkin Pit 150; development drilling 10; and exploration drilling 5) and an existing disturbance of 37 acres. These 37 acres of existing disturbance consist of an open pit and drill roads (20 acres) and a haul road (17 acres). The haul road runs north from the Tonkin mill to the west edge of the proposed Rooster pad and northwest to the open North Tonkin Pit located in the NW1/4 of Section 28, T.24N., R.49E.

The mining operations in the North Tonkin project consist of development of the large ore body along with a small satellite deposit nearby. Approximately 1.2 million tons of overburden or waste rock will be removed, and approximately 600,000 tons of ore will be removed and stockpiled for crushing and loading on the processing pad. Under the terms of the lease, a separate processing facility will be constructed for the North Tonkin project since tailings or processed heap leach material must remain on the lease property. The proposed facility will be located in SW1/4 of Section 27, T.24N., R.49E. No proposed structures have been constructed to date and the Rooster heap leach pad is currently on hold.

Drill roads of both projects are recontoured and reseeded in the fall after termination of use. Pits will eventually be backfilled.

1989 proposed activities: A 3.5 megawatt transmission line leading to the tailings pond of the Tonkin Springs mine and a pipeline leading from the well at the man camp to the tailings pond will be installed by July 1, 1989. 550,000 tons of ore expect to be extracted: 60,000 oxide and 490,000 sulfide. The sulfide ores will be treated using a revolutionary bio-oxidation process.

OTHER

TASEKO MINES, LTD:

Five drill holes located along the Wilderness Study Area (WSA) boundary denote the extent of surface disturbance by Taseko Mines, LTD. Air drilling was performed.

1989 proposed activities: Taseko has obtained permits from the BLM for two more drill holes located inside the WSA boundaries.

MOLYCORP INC.:

Molycorp has two claim blocks located in T.21N., R.49E. and T.21N., R.50E. on the Bartine Ranch, Nv. 1:62,500 quadrangle with a total of 3 acres of land disturbance.

EXXON:

Exxon has one claim block located in T.22N., R.52E. on the Garden Valley, Nv. 1:62,500 quadrangle with a total of 5 acres of land disturbance.

OTHER MINERAL DEVELOPMENT

Along with the active mines of Atlas and U.S. Gold/Silver State, other mineral development in the Roberts Mountains area includes two inoperative barite mines and one inoperative manganese/silver mine. The two barite mines border the Roberts Mountains wilderness study area. The manganese/silver mine is located within the WSA boundary.

Geothermal resources in the Roberts Mountains region are located along the eastern edge of the Simpson Park Mountains near McClusky Peak. Faults probably govern their location.

Oil/gas potential in the Roberts Mountains area is defined by the Three Bars allotment and the Roberts Creek allotment boundaries. One dry oil/gas well was drilled in the unsurveyed east portion of T.21N., R.49E.

CHAPTER III AFFECTED AREA

VEGETATION

The vegetation of the Roberts Mountains Region is typical of the central Great Basin and represents 6 of the 10 general vegetation zones found there (Tueller 1975). Plant communities represent the northern desert shrub, salt desert shrub, forest, pinyon/juniper woodland, mountain brush and hydrophilous zones. A detailed vegetation map was derived from information inherent in the completed, but yet to be published, soil survey for Eureka County, Nevada.

The vegetation map includes the following types (Table 2): Big sagebrush (Artemisia tridentata tridentata), Wyoming big sagebrush (Artemisia tridentata wyomingensis), Mountain big sagebrush (Artemisia tridentata vaseyana), riparian (hydrophilous), mountain mahogany (Cercocarpus ledifolius), pinyon(Pinus monophylla)/juniper(Juniperus osteosperma) woodland low sagebrush(Artemisia arbuscula).

The elevational distribution of the vegetation goes through a gradient starting in the valley bottoms with salt desert shrub vegetation characterized by stands of shadscale (Atriplex confertifolia) and black greasewood (Sarcobatus vermiculatus). There are few grasses here including salt grass (Distichlis spicata), alkali sacaton (Sporobolus airoides), Squirreltail (Sitanion hystrix) and Indian ricegrass (Oryzopsis hyumenoides). Upslope from the salt desert shrub are the wyoming big sagebrush stands. These sites support little understory vegetation and have been strongly altered by heavy grazing. Remnant specimens of the following grasses can be found; Indian ricegrass, squirreltail, needle-and-thread (Stipa comata) and Great Basin wildrye (Elymus cinerus). At higher elevations yet, the vegetation changes to a dominance by big sagebrush and most of the same grasses. Other grasses that might become important here include Sandberg's bluegrass (Poa sandbergii) and Thurber's needlegrass (Stipa thurberiana). This type is often found on the terrestrial sites above the stream channels at the lower elevations.

Intermingled with the big sagebrush sites are sites with black sagebrush (Artemisia nova) as the shrub dominant. Indian ricegrass is an important grass in this type.

At higher elevations intermingled with the black sagebrush and big sagebrush sites the terrain is occupied by pinyon/juniper woodland. This woodland is discussed under forestry in a later section of the CAR report.

Intermingling down into the pinyon/juniper woodland and above the pinyon/juniper woodland is another sagebrush type, the mountain big sagebrush. The common grasses are Sandberg's bluegrass, Idaho Fescue (Festuca idahoensis), bluebunch wheatgrass (Agropyron spicatum), Squirreltail and Great Basin wildrye. At higher elevations there are stands of curlleaf mountain mahogany with associated grasses similar to those in the mountain big sagebrush. Other mountain brush species include snowberry (Symphoricarpus oreophilous) and sevice berry (Amelanchier pallida).

At the highest elevation there are stands of quaking aspen (Populous tremuloides) and limber pine (Pinus flexis). The latter is discussed briefly under the forestry section of this report.

The riparian vegetation is relatively sparse on the mountain with just over 100 acres of meadow. There are numerous degraded meadows with invaded sagebrush and remnant riparian species including carex and sedges along with Great Basin wildrye and streambank wheatgrass (Agropyron riparium). Areas of choke cherry (Prunus melanocarpa), willow (Salix sp), wild rose (Rosa woodsii). These are critical areas for wildlife habitat and must be managed accordingly. Any destruction or alteration of these sites must be carefully considered.

Table 3 presents a summary of all existing surface disturbance areas with acreage given by both mining company and by vegetation type. The vegetation impacted is approximately 1029 acres distributed over several vegetation types.

The impacts from this vary from low impact on degraded rangeland at the lower elevations to high impact on sagebrush/grass mountain brush (including mahogany) and pinyon/juniper rangelands at higher elevations (Table 3). Sagebrush/grass and pinyon/juniper woodland types are impacted the most. Little impact is found on the mountain mahogany type or any of the salt desert shrub vegetation which is indicative of most of the mining taking place at higher elevations. The impact on riparian vegetation is only a few acres although these areas are a very important to the wildlife and livestock operations on the mountain range.

Table 2: PRESENTLY IMPACTED VEGETATION TYPES IN THE ROBERTS MOUNTAINS REGION.

VEGETATION TYPE	ACRES
Wyoming big sagebrush	204.00
Big sagebrush	223.75
Pinyon/Juniper woodland	229.50
Mountain mahogany	31.00
Mountain big sagebrush	181.25
Low sagebrush	105.00
Black sagebrush	53.25
Shadscale	0.00
Greasewood	1.00
Barren	9.00
Total	1028.75 *

* Exclusive of the barren category.

TABLE 3: VEGETATION TYPES OCCURRING IN MINING COMPANY SURFACE DISTURBANCE AREAS

MINING COMPANIES		VEGETATION TYPES
ASARCO	(12)	Pinyon/Juniper Woodland (6)
		Mountain Big Sagebrush (4)
		Mountain Mahogany (2)
	(3)proposed	*
ATLAS	(576)	
Gold Bar	(426)	Basin Big Sagebrush (249)
		Wyoming Big Sagebrush (110)
		Pinyon/Juniper Woodland (35)
		Black Sage (30)
		Greasewood (2)
	(0)proposed	
Gold Bar II	(150)	Mountain Mahogany (105)
		Pinyon/Juniper Woodland (40)
		Low Sage (5)
	(817)proposed	*
EXXON	(5)	Pinyon/Juniper Woodland (5)
	(0)proposed	
HYCROFT	(10)	Pinyon/Juniper Woodland (5)
		Wyoming Big Sagebrush (5)
	(.6)proposed	*
MOLYCORP	(3)	Wyoming Big Sagebrush (1.5)
		Black Sage (1.5)
	(0)proposed	
NERCO	(22)	Pinyon/Juniper Woodland (18)
		Basin Big Sage (14)
	(13.3)proposed	*
PEGASUS	(7)	Pinyon/Juniper Woodland (7)
	(0)proposed	

PHELPS-DODGE	(7)	Pinyon/Juniper Woodland (5) Mountain Big Sagebrush (2)
	(12)proposed	Pinyon/Juniper Woodland (7) Mountain Big Sagebrush (5)
SANTA FE	(7)	Pinyon/Juniper Woodland (3) Basin Big Sage (2) Degraded Meadow (1.25) Wyoming Big Sagebrush (.75)
	(0)proposed	
US GOLD/SILVER	(447)	
N. Tonkin	(37)	Mountain Big Sagebrush (20) Pinyon/Juniper Woodland (13) Basin Big Sagebrush (2) Low Sage (2)
	(0)proposed	
S. Tonkin	(207)	Basin Big Sagebrush (135) Mountain Big Sagebrush (40) Low Sage (20) Pinyon/Juniper Woodland (12)
	(0)proposed	
Man Camp	(20)	Wyoming Big Sagebrush (20)
	(0)proposed	
US BORAX	(2)	Pinyon/Juniper Woodland (2)
	(0)proposed	

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acres impacted in parentheses

* proposed areas where the vegetation type to be disturbed is not yet known

SOILS

A soil survey has been completed but not yet published for Eureka County, Nevada within which is found the Roberts Mountains Region. The soils are found on several landforms; the bonding mountains (not well defined but used to identify slope components and to separate hills from mountains by defining the former as a highland mass which rised less than 1,000 feet above the surrounding boundaries), the piedmont slopes , the basin floor and the mountains(Terms from Peterson, 1981).

The Kobeh Valley portion of the region is found on unit #6 of soil survey area 776. Unit #6 consists of durixerollic camborthids, xerollic haplargids and haploxerollic durorthids. These are level to moderately sloping , very deep and moderately, deep, well drained soils on fan skirts and fan piedmonts.

Unit #9 is located in on the northwest portion of the region. This unit consists of durixerollic haplargids and durorthidic xeric torriorthents. These are gently sloping to strongly sloping, very deep, well drained soils on fan piedmonts and inset fans.

Unit #10 consists of haploxerollic durargids found on gently sloping to moderately sloping, moderately deep, well drained soils on fan piedmont slopes. These soils are found on the south and west sides of the region sloping from unit #6 to unit #s 16 and 18 in the mountains.

At higher elevations in the region the soils are parts of soil survey units #16 and unit #18. Unit #18 includes west side of the region extending from the Tonkin mine areas south and eastward along the west flank of the Roberts Mountains. These soils are aridic argixerolls and pachic argixerolls and can be characterized as strongly sloping to steep, deep and very deep, well drained soils; on mountain side slopes.

Unit #16 covers the majority of the region including the WSA and the east side of the mountainous part of the region. These soils are lithic xeric torriorthents and lithic haploxerolls on strongly sloping to very steep, very shallow and shallow, well drained and somewhat excessively drained soils, on mountain side slopes.

These soils are relatively typical of soils associated with sagebrush and pinyon/juniper vegetation types in central Nevada. They tend to be quite stable and do not erode under conditions where a reasonable vegetation cover is maintained. There appear to be no highly erodible soils that present a strong hazard to sedimentation or other factors associated with mining operations.

PALEONTOLOGY

Roberts Mountains is one of the most highly fossiliferous areas in the entire country. Several hundred species of fossils are known to exist and are described in such works as Mariam

(1942) and Stumm (1949). Unique occurrences include fossil fish such as Eustenopteron coccostrus lativus and several other genera. Several new species of coral, bracciopods and probably crinoids, mollusks and fish are yet to be identified. Vertebrate mammals should also be closely examined. James Firby (paleontologist*) strongly urges that this unique fossil record be seriously considered in terms of mining.

RANGE MANAGEMENT

Domestic livestock grazing has been a traditional use of the Roberts Mountains region since well before the turn of the century. Relative to this technical report two allotments are involved, the Three-Bar allotment and the Roberts Mountains allotment. The permittee in both cases is Filbert Etcheverry doing business as Eureka Livestock Company. Mr. Etcheverry has held the permit since 1948 and has managed livestock in the area since that time. The Three-Bar allotment is involved only along the western part of the haul road while the Roberts Mountain permit involves grazing use relative to the eastern half or more of the haul road and the sites designated as the Goldstone, Gold Ridge and Gold Pick open pit mines and their dumps, roads, and ancillary facilities and the heap leach area.

The Roberts Mountain allotment (Eureka Livestock Company) includes approximately 173,863 acres which annually supports 20,943 animal unit months (AUM) of dual use, i.e., sheep and cattle. The livestock are managed as cow-calf and ewe-market lamb enterprises. The normal period of sheep use in the area is late spring/early summer. The sheep AUMs number 6,210 with peak numbers from April 16 until October 15. The sheep are trucked to the allotment some time in April and the lambs are shipped by mid June. Part of the actual use by livestock in the area (or approximate vicinity) is by six bands of sheep (average size of each band is 885 head) for about 60 days which equals 354 AUMs for each band. Two of the bands are usually unloaded at the crested wheatgrass field near the Roberts Creek Ranch. These bands normally move up into the region of the new mine area shortly thereafter or at least by the first of May.

Cattle use in the area by the Eureka Livestock Company consists of three herds of cattle, one headquartered at the Three-Bar Ranch, one at the Alpha Ranch and the one involved in the area of the new mine area headquartered at the Roberts Creek Ranch. Potentially 14,283 AUMs are involved. Cattle are licensed for 11 months with base property being utilized in October-November. At least some cattle graze from March 10 until February 28th each year. Peak numbers are grazed from April 10 until the middle of October.

As the band os sheep described above moves through the foothills of the Kobeh Valley they will approach the haul road. Depending upon the location and the steepness of either cuts or fills, there may be a problem in moving the sheep across the road as they move toward the mountainous areas where they usually grazed. Traditional herding of these bands has allowed the animals to move up and down the slope in the vicinity of the haul road to and from water and feed. This management approach will be precluded by the haul road because of the danger to the sheep from the haul trucks. Sheep have been known to be attracted to roads and spend time there thus placing them in danger of being run down by heavily laden haul trucks. This area is in the vicinity of the three proposed new pits. This potentially could cost the operator (Eureka Livestock Company) the use of a lamb finishing area for two of their bands and thus reduce the number of bands that they usually graze in the area.

The area around Roberts Creek is heavily used by the cattle from the Roberts Creek Ranch herd as they are released in the Spring (April 10 onward) and move north in the Roberts Mountains area. Because Roberts Creek is the closest regular water source in the project area, it is heavily used by cattle that will graze in the area of the new mine venture. When the cattle are put on the allotment they normally go up Roberts Creek in a short specified time frame and will not be unduly hampered in their movements by the proposed haul road. The principle impact on this herd would be to reduce the total grazing area and available AUMs. Also it is likely that the movement of the herd in the vicinity of the mine will be very much restricted because of the steep slopes and the steeper slopes associated with the roads used for the mining operation.

The removal of vegetation resulting from new mine development will result in decreases in approximately 137 AUMs of forage. This figure was calculated from the AUM carrying capacity designations depicted on the maps and write-up sheets for the 1961 BLM range inventory or survey of the area and based on dual use AUM figures for the original adjudication. Total exclusion of livestock from the allotment would mean a potential loss (if all available AUMs were used) of 15,183 AUMs of use on the allotment. Of greater potential consequence to the permittee would be a forced requirement to change the basic mode of operation particularly with the bands of permitted sheep although the cattle operation would also be impacted.

The Eureka Livestock Company is unique in at least two ways. First, the ranch has been managed successfully and is making a good return on investment, and second, it is one of only a very few ranches that successfully operates in two states and with two classes of livestock. The rancher indicates that the new mine area will strongly impact the operation. The greatest impact will be on the value of the ranch. It is estimated by the permittee that the economic impact will be a reduction of 33 percent in the sheep operation and 10 percent in the cattle operation. The permittee indicates that each lamb sold represents a return of $50-100 with most staying in the area, and a net return of from $25 to $30 per lamb.

Other impacts include increased use of the road through the Roberts Creek Ranch, filling in of cattle guards by increased mining company traffic, increased wild horse competition for forage, reduced forage (AUMs), a potential for increased unauthorized removal of livestock (poaching and possibly more road kills of livestock) and a general well-being impact on the permittee and his family. The permittee indicated very clearly to us that the mining activity clearly impacts the feelings that the ranch family has toward the ranch setting and activities at the ranch. This perception on the part of the rancher's family is brought about by the new roads, increased traffic and movement of people in the area, changing of the landscape, and real or imagined changes in how the ranch has been traditionally managed.

A second ranch operator is involved in the northern part of the region. The J.D. Ranch is an integral part of Russell Ranches, located throughout central and northern Nevada. Russell Ranches are owned and operated by Dan Russell, P.O. Box 835, Sacramento, CA 95804. Russell Ranches general manager is Dick Mecum, Eureka, while J.D. Ranch foreman is Gary Buchannon.

The J.D. Ranch allotment includes approximately 143,000 acres of federal lands administered by the BLM. Of that approximately 45,000 acres, or 31% lies within the Roberts Mountain Cumulative Analyses Report (CAR) area. The J.D. Ranch allotment includes some 12,881 AUM's of total livestock use, with 4,560 currently in a suspended status leaving 8,321 active AUM's. Currently the Ranch is licensed for use of 6,149 AUM's, or slightly less than 75% of it's full permitted use. Season of use for cattle runs from May1 through October 31, with roughly 1,000 cattle being out in May and June and 1,400 from July - October. The current Ranch operation includes a cow-calf operation, with calving occurring through the months of May - July. Calves are weaned in October - November, with dry cows being maintained on Ranch resources during the winter period.

The major confrontation between the J.D. Ranch and current mining activity is occurring in the Tonkin Springs area. Mining activity at that site is under the direction of U.S. Gold/Silver State Mining Company and includes an open pit mine, milling site and leach pad and ponds. Due to the remoteness of the site a man camp also exists at the Tonkin Springs site. At this facility, designed to handle 100 inhabitants. Employees live for 10 days continuously before leaving. No off site recreational facilities exist, except the multiple use of the surrounding federal lands. Due to pressures from the Man Camp, ranch management has closed Tonkin reservoir to public fishing.

Ranch management indicates that due to the total mining activity in the Tonkin Springs area approximately 200 less cows are currently grazed at the Tonkin site. This represents approximately a 20% reduction in the total carrying capacity of the Ranch. (Note: current licensing for the J.D. Ranch supports these figures). The argument could be made that in relation to the total Ranch allotment the impact in the Tonkin Springs area is minimal, and doesn't warrant a reduction of 20%. However, the Tonkin Springs area is critical, in that it represents some of the best forage resources of the entire allotment. Because of this, Ranch management normally uses this field during the months of June - August which coincides to the breeding period of their cows, which is also the peak period of nutritional requirement. Other forage resources within the total J.D. Ranch allotment simply do not exist to replace this critical area. Movement of cattle to a less desirable area for the critical breeding period would have a detrimental effect upon subsequent calving rates. Consequently, mining activity at the Tonkin Springs site represents a proportionally larger impact to the J.D. Ranch than the simple loss of average AUMs.

The J.D. Ranch management provided the following information relative to mining impacts to the overall ranching operation, as well as the immediate impact in the Tonkin Springs area.

1. DIRECT FORAGE LOSS: Within the Tonkin Springs area there are presently 264 acres disturbed by mining activity, representing a present loss of 22 AUMs. Ranch management indicates that due to the accelerated exploration activity within the area, any estimation of forage loss would basically be "out of date" by the time it is calculated. In addition to direct loss of forage, Ranch management felt that the increased activity was also opening up surrounding range for invasion of cheat grass and other undesirable annual plants. This would ultimately reduce the quality of existing forage, as well as greatly increase the opportunity for fire.

2. INDIRECT FORAGE LOSS: Due to the extensive network of roads, drilling sites and other activities these areas are for all practical purposes not available for convenient, reasonable livestock use. Although estimations of this loss would be difficult, management felt that it would greatly exceed direct forage loss.

3. LIVESTOCK MANAGEMENT: Much of the loss of usable forage under item 2 could also be considered under increased livestock management problems. Ranch management stressed that the level of activity was so great in the general vicinity of the mine that livestock simply would not graze in the area. Further, activity is such that the successful herding of livestock through the immediate area has become difficult if not impossible. Additionally traffic on all area has become heavy enough to represent a constant threat to grazing livestock, as well as their orderly movement or herding. These and related problems constantly are a threat to fences and cattle guards. Many fences have been broken, or knocked down. Increased road maintenance has resulted in most cattle guards becoming filled with dirt and rendered useless.

3. OTHER PROBLEMS: Management indicated that many other problems exist, primarily associated with the increased presence of people during off working hours. These include the loss and/or destruction of personal property, including buildings and cattle. Management attributed one dead cow to these factors within the past 12 months, but felt that unaccounted livestock loss was

probably far in excess of that figure.

In summarizing problems, the ranch management felt that a doubling of present mining activity within the Tonkin Springs area would essentially render that field useless for further livestock grazing. Management also expressed concern about similar problems ultimately occurring in the Willow Creek area, as that currently represents the only other area of "quality" summer forage available to the J.D. Ranch. Ranch management indicated that they had established a good current working relationship with mine management, in that the mine would repair or replace items that were destroyed or damaged by mining activity. However Ranch management again stressed that due to just the physical presence of the accelerated mining activity livestock grazing within the area was becoming increasingly difficult. Further, no amount of "on-site" mitigation would cure that loss. Additionally the mine could not, or would not be responsible by problems caused by employees during off hours, or problems caused by the increased presence of service personnel or other interested observers.

WILD HORSES

The Bureau of Land Management has two wild horse units associated with Roberts Mountain and the northeast portion of Kobeh Valley Unit A is referred to as the Roberts Mountain Herd Management Area (HMA) and covers the southernmost end of Roberts Mountain and the northeast end of Kobeh Valley. Unit B is that portion of Roberts Mountain north of the HMA and including Garden Valley and Table Mountain.

The BLM has conducted six wild horse inventories in the Roberts Mountain area (Table 4). These inventories show the majority of horses to be located roughly south, east and west of the proposed operations area. The BLM has an objective of maintaining an approximate management level at or above 127 horses inside the HMA (Unit A). The objective for unit B is total removal of wild horses. In August 1987, 120 horses were captured and removed from Units A and B. Currently, there are an estimated 132 horses in the Roberts Mountain HMA.

TABLE 4: INVENTORIES OF WILD HORSE HERDS IN THE ROBERTS MOUNTAIN AREA.

Date of Inventory	Number of Individuals
February, March 1975	31
January, February 1978	115
May 1982	127
September 1985	184
July 1987	348
September 1987	132*

* - Inventoried after August 1987 capture and removal.

WILDLIFE

The following describes possible effects on major wildlife found in the Roberts Mountains area. There are many other wildlife species utilizing habitat in the Roberts Mountains area; these are listed in the Roberts Mountains Habitat Management Plan (unpublished; BLM), and Battle Mountain Wildlife Species list (unpublished).

MULE DEER

The mule deer is the primary big game animal in the Roberts Mountains area. The Nevada Department of Wildlife (NDOW) classifies Roberts Mountains as a critical mountain range for mule deer. The area includes 26 percent of the total summer range in NDOW's Management Area 14 which includes the Diamond Mountains, the Fish Creek Range and the Cortez Mountains. The Roberts Mountains are utilized by mule deer primarily in the summer with little winter use. Approximately 80 percent of the summer herd migrates to the Fish Creek or Sulphur Spring Ranges to winter. The mule deer that remain on the Roberts Mountains usually winter in the vicinity of Rutabaga Mountain and Roberts Creek Basin. The Roberts Mountains mule deer population has either increased or remained stable from the late 1970's into the early 1980's, but has decreased over the last four years. This is thought by the BLM to be attributed to poor summer range conditions possibly due to competition with sheep and cattle coupled with increased disturbances from mineral exploration. In some cases the overgrazing may be due to an over-expansion of deer numbers in relation to available forage. Hunting pressure is generally light, with 10-15 percent of the Management Area 14 harvest coming from the Roberts Mountains (Elliott, D. and Podborny, M., Nevada Department of Wildlife/Eureka, personal communication, 1989).

SAGE GROUSE

Roberts Mountains and the nearby Simpson Park Mountains constitute the major sage grouse range of east-central Nevada. Nearly 65 percent of the Eureka County sage grouse harvest comes from this area. The area has 23 known strutting grounds and 12 brood-rearing areas. These, along with nesting sites (usually located within two miles of the strutting grounds) and upland meadows, constitute the most crucial habitats for sage grouse The major concern regarding sage grouse in the Roberts Mountains area is the condition of the meadows; many are in fair to poor condition in part due to heavy utilization by livestock. The degradation of meadows by livestock, along with drought, hunting, human disturbance and predation has led to declining sage grouse habitat and populations in the area.

RAPTORS

The Roberts Mountains area provides excellent nesting habitat for a variety of raptors. Raptor nesting data, collected in the area by the BLM, is listed in Table 5. From the original 23 nests surveyed in 1981, only 15 were active in 1988. The decreased nesting activity for some species may be attributed to the increased disturbances from mining exploration and development.

TABLE 5: RAPTOR NESTING DATA FOR ROBERTS MOUNTAINS 1981-1988. NUMBER OF ACTIVE NESTS.

Species	1981	1982	1983	1984	1985	1988
Red-tailed hawk	10	3	2	7	1	11
Great horned owl	2	1	0	0	0	0
Goshawk	3	0	0	2	1	2
Prairie falcon	2	*	1	3	0	1
Cooper's hawk	5	0	0	0	1	0
Marsh hawk	1	1	0	0	*	0
Golden eagle	*	*	*	*	*	1
Totals	23	5	3	12	3	15

* - not surveyed

BIGHORN SHEEP

Desert Bighorn Sheep (Ovis canadensis nelsonii) were historically distributed in the Roberts Mountains region prior to 1850. The last unconfirmed sighting of a bighorn in the area was in the early 1970's. The Nevada Department of Wildlife has listed Roberts Mountains as a potential site for reintroduction of bighorn (Stiver, S., NDOW, personal communication, 1989). Under current grazing systems, domestic sheep utilize the Roberts Mountains area. Due to the possible transmittal of diseases or parasites from domestic sheep to bighorn sheep, introduction is impossible. Reintroduction will be feasible only if domestic sheep are removed.

FISHERIES

The 11 perennial streams within the Roberts Mountains area are Roberts, Vinini, Pete Hanson, Birch, Willow, Coils, Henderson, Denay, Kelley, and Cottonwood Creek along with Tonkin Spring. The species inhabiting these waters include rainbow trout, brown trout, brook trout, cutthroat trout, rainbow and cutthroat trout hybrids, and speckled dace. Other streams in the area are intermittent, generally being associated with runoff and small springs, and do not have enough flow to support fisheries. Sport fishing is limited to Roberts Creek, Vinini Creek and Tonkin Spring.

Roberts Creek has approximately seven miles of fishable waters located on BLM land. Rainbow, Brook and Brown trout are found in varying numbers throughout the creek. These populations are perpetuated by a combination of natural spawning and stocked populations. The Nevada Department of Wildlife has stocked Roberts Creek on a yearly basis since 1967. A 1979 stream survey indicated that population and size of fish were limited by the lack of quality pools and a low pool-riffle ratio (Roberts Mountains HMP, BLM, unpublished).

Vinini Creek runs on five miles of BLM land but varies greatly depending on year to year weather conditions. Rainbow trout were stocked in the 1950's, 60's, and 70's and a small population of naturally spawning fish has remained. These fish are limited by low water flow and lack of quality pools. Vinini Creek is being looked at as a possible area for introduction of cutthroat trout (Walt Campbell, Nevada Department of Wildlife/Austin, personal communication, 1989).

Tonkin Spring has approximately .75 miles of fishable water on BLM land. The spring maintains an excellent flow and supports a healthy population of rainbow trout. The limiting factors appear to be poor bank cover and a total absence of quality pools.

Pete Hanson Creek flows for approximately 4.4 miles on BLM land. cutthroat trout were planted above a 20 foot waterfall on the main fork of the stream in 1983 and a small population was found during a 1984 stream survey. Hindering factors appear to be a low pool-riffle ratio and an absence of quality pools.

Birch Creek flows 5.5 miles through BLM land before being diverted to Willow Creek Ranch. Rainbow and cutthroat trout hybrids were found during a 1988 NDOW stream survey. Some possible pure cutthroat trout were collected and sent to the University of California-Davis for analysis. Results have not been disclosed at this time.

THREATENED AND ENDANGERED SPECIES

Lahontan cutthroat trout, listed as Threatened under the Endangered Species Act, were planted on the main fork of Pete Hanson Creek in November 1983. A stream survey was conducted in 1984 and a population of 10.3 trout were estimated over the 0.5 mile of occupied flow. A possible population of pure cutthroat trout may have been found in Birch Creek, but analysis has not been determined at this time. Peregrine falcons and Bald eagles, federally-listed endangered species, have been observed on the Roberts Mountains but no known nesting activity exists within the area. There are no endangered plants reported in the region..

FORESTRY

Within the region boundary, the single leaf pinyon pine (Pinus monophylla) and Utah juniper (Juniperus osteosperma) are the dominant tree species. These generally occupy the midland elevational areas (6,500 to 7,200 feet), growing in dense communities. The higher elevations (7,200 to 10,000 feet) are inhabited by curlleaf mountain mahogany (Cercocarpus ledifolius), quaking aspen (Populus tremuloides) and serviceberry (Amelanchier alnifolia). Aspen stands are irregular in size and density, and are found usually near drainage meadows and spring areas. Stands of curlleaf mountain mahogany and serviceberry are less dense and often inhabit the more rugged and inaccessible sites. Only one other member of the pine genus occupies these higher elevations - limber pine (Pinus flexilis), and is found in only limited numbers.

Other tree species found in the study area are usually classified as riparian vegetation. These include two species of cottonwood - Fremont cottonwood and black cottonwood (Populus fremontii and trichocarpa), willow (Salix spp.) and chokecherry (Prunus virginianus).

Single leaf pinyon pine and Utah juniper are the only species which are managed for forest products. Harvest of cordwood, juniper posts, and Christmas trees are managed on a selective cut basis and only in designated areas. Pinyon pine nuts are harvested in the study area, with abundant crops occurring every three to four years. The commercial harvests of pinyon\juniper, in many cases, are designed to improve wildlife habitat through the release of understory species.

Firewood production (cordwood) averages approximately 7-9 cords/acre. Fenceposts (juniper posts) amount to about 25 posts/acre. Christmas trees account for 13 trees/acre, and pinyon pine harvests total around 10 pounds/acre.

Mining exploration and operational activities include the construction of roads, ponds, leach pads, pits and structures, and drilling . Relative to the forest resources, overall direct and indirect impacts should be minimal. Construction of new roads and exploratory drilling will result in minimal losses of tree species (i.e. pinyon/juniper). However, the roads will provide access into previously undisturbed areas for recreational vehicles, etc. Increased public use in these areas could have a negative impact on commercial tree species and associated vegetation.

The construction and operation of the actual mines will, again, result in minimal losses of vegetation. Impacts on forest resources will be directly related to the increased levels of human activity (i.e. mine employees commuting and working in areas), and increased vehicular traffic in previously undisturbed locales. These factors could affect the unlawful harvest of cordwood, etc., and increase the probability of unnatural wildfires.

WILDERNESS

The Roberts Mountains WSA has great potential for both precious and base metals as well as barite. Geologic structure and stratigraphy indicates favorable conditions for mineral exploration within the WSA. As of March 1989, no mining activity can be performed that requires reclamation in the WSA.

Mining claims located within the WSA include Asarco, Pegasus, Taseko, and Phelps-Dodge. Only two companies, Taseko and Asarco, have conducted exploration activities within the WSA boundaries. Taseko has drilled 5 holes, all of which have been totally reclaimed. An approved drill hole will not be drilled and Taseko has no further exploration plans. Asarco's exploration activity consisted of approximately 12 drill holes; al have been reclaimed. There are currently no active exploration operations within the WSA.

RIPARIAN

Riparian areas exist throughout the Roberts Mountains area along perennial and intermittent streams. There are approximately 664 acres of riparian along these streams. This figure was found by applying 12 acres per mile for perennial streams and 5 acres per mile for intermittent streams. The amount of moisture in a given area is the only limiting factor as to where this habitat type occurs. Riparian vegetation is classified into aspen/cottonwood, willow/prunus, and rose/ribes. Habitat condition of these riparian types range from fair to poor. Meadows constitute approximately 106 acres in the Roberts Mountains area. The majority of these meadows are in fair condition, however, some are very poor. In some cases, overuse by livestock has led to invasion of undesirable plant species and consequently, their value to wildlife have greatly diminished.

The revised Roberts Mountains Management Plan puts special emphasis on the restoration and protection of riparian and meadow communities. The BLM has draft riparian management plans encompassing some 16 miles of riparian habitat along streams in the area at a cost of $70,000 to $100,000. Management plans are also being developed for 121 acres of meadows, springs, aspen groves, and other streams. All these management plans include grazing management practices such as herding, utilization levels, and season of deferment.

RIPARIAN MANAGEMENT

From about three miles north of the reservoir up to the headwaters, Roberts Creek is managed according to a Riparian Management Plan under direction of the Battle Mountain District of the Bureau of Land Management (BLM, 1988). Under this Plan, and in an attempt to restore and protect riparian instream values, the middle and north forks of Roberts Creek are protected from grazing, and part of the eastern portion of the watershed is under only limited grazing.

The Plan also includes improvements in Vinini, Henderson, and Pete Hanson Creeks. Vinini Creek, along with Roberts Creek, is considered by the BLM to have the potentially greatest resource values of all perennial streams in the Roberts Mountains. It and Henderson Creek are managed under the Riparian Plan to improve aquatic and riparian habitat. The improvements are done through installation of riparian pasture fences, fencing stream corridors, and practicing sheep-use limitations. Pete Hanson is managed for Lahontan Cutthroat Trout habitat and improvements consist of limiting sheep use.

The other streams in the project area that are tributary to Coils Creek also have developed riparian areas that are sustained by spring-flow, and the BLM has riparian management objectives for them as well. Currently, the BLM is working towards improving the quality of riparian areas, and thereby improving the water quality and channel substrate. They have initiated projects such as fencing wet-meadows, repairing headcuts, installing gabion-type structures and planting willow stock on Cottonwood, Jackass and Meadow Creeks.

AIR RESOURCES

CLIMATE

The general climate of Nevada is mid-latitude steppe. Daily conditions are normally characterized by low humidity and clear skies with large diurnal variations in temperature. Wind patterns are generally westerly but are locally channeled by the north/south orientation of the mountain ranges. The topography can also generate a weak diurnal wind pattern as cooler mountain air sinks into the valleys in the early evenings and the warmer valley air rises up the slopes in the mornings. This diurnal air flow is most pronounced where canyons funnel the mountain air through narrow canyon mouths. The speed and direction of surface winds in Nevada reflect prevailing storm tracks and the Basin and Range topography. Wind patterns reflect local topographic conditions, in this case the Roberts Mountains, particularly when the general wind flow is light. Wind speed, direction, and temperature data have been collected at the Atlas Minerals Gold Bar operation since April of 1985. Winds in that area are predominantly westerly to northwesterly.

The climate in Eureka County is typical of the northern

Great Basin, with average July temperatures ranging between 65°F and 75°F in the lower valleys, becoming cooler with increasing elevation. The south end of the county averages about 13 days per year with maximum temperatures exceeding 90°F, while in the north the average is over 50 days per year. The highest reported temperature in the county is 108°F. Much of the region, however, fails to record a 100°F maximum during any given year. Winter temperatures are similar to those in surrounding areas, averaging between 20°F and 30°F in the valleys. Minimum temperatures as low as 42°F below zero have been recorded, but are very exceptional. Frost may occur from early September through June.

The average annual precipitation and evaporation in the Atlas Minerals Gold Bar mine area are about 11 inches and 49 inches, respectively (Welsh, 1987). Table 6 summarizes precipitation and evaporation data for the Gold Bar area. January through March is usually the dryest period, while highest evaporation rates normally occur during June and July.

Precipitation averages are expected to be somewhat higher in the Roberts Mountains area due to the elevation difference (approximately 1,000 to 2,500 feet higher than that of the Gold Bar site), along with the higher volume of snow which accumulates during the winter. Somewhat lower precipitation averages are likewise expected in the areas of lower elevations. The evaporation data shown in Table 6 are from the Fallon Experiment Station in Fallon, Nevada. Monthly data were available for the most months of the year, but the winter months were extrapolated from the existing data (Welsh, 1987).

Precipitation frequency data obtained from nomographs (NOAA, 1973) are summarized in Table 7. Ranges of precipitation are given to reflect the different elevations in the existing and proposed project areas. The values given as the higher end of the range would reflect those precipitation depths in the higher elevations.

TABLE 6: ATLAS MINERALS GOLD BAR AREA PRECIPITATION AND EVAPORATION.

MONTH	PRECIPITATION (inches)	EVAPORATION (inches)
January	0.62	1.28
February	0.58	1.76
March	0.72	2.64
April	1.17	4.79
May	0.87	5.50
June	1.50	7.30
July	0.84	7.80
August	1.00	6.42
September	1.08	5.09
October	0.83	2.99
November	1.14	2.01
December	1.06	1.42
Annual Totals	11.41	49.00

The amount of precipitation that falls as snow depends on elevation. In Elko, which is at an elevation of about 5,150 feet and is about 80 miles to the northeast, approximately 40 percent of the annual precipitation falls as snow. Elevation ranges in the CAR area from about 6,500 to 10,133 feet. Those areas within the CAR area which are at an elevation similar to that of Elko would have a similar percentage of snow as does Elko. A higher percentage of snow would be expected in the higher elevations of the Roberts Mountains.

TABLE 7: STORM PRECIPITATION AMOUNTS

Storm Event	Precipitation Depth (inches)
2 year - 24 hour	1.4 - 1.6
5 year - 24 hour	1.6 - 2.0
10 year - 24 hour	1.6 - 2.2
25 year - 24 hour	1.8 - 2.6
50 year - 24 hour	2.0 - 2.8
100 year - 24 hour	2.2 - 3.2

Temperature data have been collected at the Atlas Minerals Gold Bar mine site on a one-day-in-six schedule since April of 1986. These data are summarized in Table 8.

TABLE 8: ATLAS MINERALS GOLD BAR MINE SITE TEMPERATURE DATA (MEANS FOR PERIOD 1986-1988).

Month	Max Average 24-hr (°F)	Min Average 24-hr (°F)	Mean Average 24-hr (°F)
January	25	16	19
February	34	13	26
March	43	32	33
April	59	26	47
May	67	35	50
June	68	55	61
July	69	51	61
August	75	51	61
September	72	31	49
October	45	31	40
November	46	24	35
December	32	16	25

AIR QUALITY

The baseline air quality of the rural areas in Nevada is normally very good. Since industrial activities in the Roberts Mountains area are limited and the human population is small, the air quality in the project area is also very good. The nearest town is Eureka, about 30 miles to the southeast. Eureka has a population of about 1,000 and is primarily economically dependent on mining and agriculture. The two primary sources of TSP in the CAR area are the U.S. Gold Tonkin Springs Mill and the existing Atlas Minerals Gold Bar operations. The Tonkin Springs Mill is in the northwest section of the CAR area. The NDEP air quality application review for the Tonkin Springs Mill states that the modeled particulate emissions are well below the 24-hour and annual standards for all sources. The annual controlled particulate emissions from this operation have been estimated to be 21 TPY.

Atlas has been monitoring total suspended particulates (TSP) at Gold Bar since April of 1985. During that time, one year of baseline, nine months of construction and six months of operation TSP data have been collected. The location of the sampler is adjacent to the Gold Bar pit. Due to this location, TSP values have been higher than those occurring at the edge of the Atlas claim block or nearest point of public access. Wind speed, direction, and temperature have also been collected for sample perspective. Results of TSP monitoring at the Gold Bar site are summarized in Table 9.

The Nevada ambient air quality standards for TSP (24-hour and annual) are very rarely exceeded at the Gold Bar site. Upset conditions are experienced on rare occasions, but are apparently due to high winds or activity in the immediate area of the sampler. TSP monitoring has yielded data which supports the following conclusions:

1) Baseline (pre-mining) TSP values appear to be directly related to wind speed.
2) Baseline TSP values are at a minimum during the winter months, when snow cover likely minimizes particulate loading picked up by winds.
3) TSP values during the 1986 construction phase seemed to be higher when there was significant activity in the area near the sampler.
4) High wind speeds during the construction phase may have significantly contributed to higher TSP values.
5) For the period of January through March, TSP values were higher during the operational phase than recorded during baseline data accumulation. This difference probably reflects the amount of exposed, unfrozen ground in the pit area.
6) TSP data appears to have stabilized over time and now tracks fairly well with the baseline data.

TABLE 9: GOLD BAR MINE TSP DATA (MEANS FOR PERIOD 1986 - 1988).

Month	Max Average Monthly TSP (µg/m3)	Min Average Monthly TSP (µg/m3)	Mean Average Monthly TSP (µg/m3)
January	24	21	22
February	37	12	21
March	22	11	16
April	37	7	23
May	51	21	31
June	46	41	43
July	57	27	42
August	79	51	64
September	96	31	46
October	106	18	46
November	49	15	26
December	107	28	50

Annual TSP Geometric Mean for 1986= 42 µg/m3
Annual TSP Geometric Mean for 1987= 33 µg/m3
Annual TSP Geometric Mean for 1988= 30 µg/m3

Mercury emissions from the carbon reactivation furnace and the refinery furnace are low. Average emission values from the specific source tests conducted in July of 1987, the annual mercury output is 0.021 tons per year (TPY) from the carbon reactivation furnace, and 0.001 TPY from the refinery furnace. The guideline for significant rates of mercury emissions under part 556.785(3)(a) of the Nevada Revised Statues is 0.1 TPY. The mercury rates emitted at the Gold Bar mill are well below the significance guideline.

Particulate emissions from the refinery furnaces are controlled by a baghouse. Both the primary melting furnace and the remelting furnace are serviced by the baghouse. Table 10 summarizes the most recent NDEP emissions estimates for the Gold Bar facility.

Other dust and gaseous emission sources in the CAR area include primarily exploration activities. Dust emissions occur from drilling and hauling, and from wind erosion of disturbed areas. Exploration activities at each claim within the CAR area are relatively small and produce minimal and intermittent dust emissions. Table 11 summarizes these exploration activities and the expected TSP emissions associated with wind erosion of the disturbed acreage.

TABLE 10: GOLD BAR TSP EMISSION SOURCES

SOURCE	UNCONTROLLED EMISSION (TPY)	ALLOWABLE EMISSION (TPY)	EMISSION CONTROL EQUIPMENT	ESTIMATED ACTUAL (TPY)
Bullion Furnace	2.15	0.63	Baghouse	0.02
Carbon Kiln	17.52	7.06	***1	***1
Lime Silo	0.53	9.34	Baghouse	<0.01
Ball Mills	70.96	275.96	Water	7.10
Impact Crusher	3547.56	275.43	Water	106.43
Mercury Retort	0.00	1.34		0.00
Remelt Furnace	3.26	0.83	Baghouse	0.03

The NDEP analysis of the emission potential of the carbon reactivation kiln is currently under evaluation. Atlas has submitted additional information regarding the process and requested NDEP to reconsider their calculated emission estimate based on the new information. Under NDEP requirements, emissions from the carbon kiln will not be operated at levels exceeding the final emission values which are computer simulated for this particular process. Atlas will meet the emission restriction imposed by DEP, but this emission value will likely be modified.

Since the Gold Bar mining activities and the other exploration activities in the CAR area all produce air emissions in separate locations, to sum estimated emissions would be a misleading way to describe the cumulative baseline status within the CAR area. The most conclusive statement with respect to air emissions in the CAR area at this point would be that existing emissions are concentrated at the Gold Bar location with small amounts of TSP emissions throughout other portions of the CAR area.

TABLE 11: TSP EMISSIONS ASSOCIATED WITH EXPLORATION ACTIVITIES IN THE CAR AREA.

COMPANY	ACTIVIES	DISTURBED ACREAGE	ESTIMATED TSP EMISSIONS1
Asarco			
3802 Plan		0 acres	0 TPY
3809 Notice		3 acres	1.14 TPY
Atlas -			
Wildflower		2 acres	0.76 TPY
Gexa			
SD Claims	trenches and	7 acres	2.66 TPY
Dry Claims	drill holes	1 acre	0.38 TPY
Hycroft	trenches drill roads drill holes	8 acres	3.04 TPY
Moly Corp.		3 acres	1.14 TPY
Nerco	25 drill holes 7 trenches roads	22 acres	8.36 TPY
Pegasus	13 drill holes	5 acres	1.9 TPY
Phelps-Dodge	35 drill holes (many reclaimed)	7 acres	2.66 TPY
Santa Fe	4 drill holes	7 acres	2.66 TPY
Taseko			
3802 Plan	drill holes	3 acres	1.14 TPY
3809 Notice	drill holes	0 acres	0 TPY
U.S. Borax	9 drill holes 1.5 mile road	3 acres	1.14 TPY

1 - Emissions from wind erosion of unprotected surfaces only

Incremental impacts to air resources from the proposed actions would be similar in nature to those due to the existing activities. The construction and operations associated with mining of Atlas Minerals Company's proposed Goldstone, Gold Pick and Gold Ridge pits would entail emissions of pollutants to the air from both point and fugitive sources. The primary air emissions would be fugitive dust from drilling, blasting, loading, hauling and unloading of ore and overburden; stock and waste piles; mine roads; and, wind erosion of unprotected surfaces. The maximum proposed ore and waste mining rate would be approximately 38,000 tons per day (an additional 21,000 tons per day). This is a 124 percent increase over the present average total mining rate of 17,000 tons per day. The changes in total emissions related to mining the proposed pits would be proportional to the change in mining rate. The location of the emissions would be relocated from the present Gold Bar Pit to the proposed pits. The emissions from the processing of the ore in the mill or leach pad would not change from the present situation.

The major change in air emissions at due to the Atlas expansion would be fugitive dust from the main haul road. The proposed operations would involve the haulage of the heap leach ore about 4.3 miles and the mill ore about 9.3 miles. This is compared to the present situation where the mill and leach pad are located almost immediately adjacent to the Gold Bar pit and haulage emissions are therefore minimal.

Proposed exploratory activities include drilling, trenching and road construction at the Atlas Lonewhip, Gexa, Nerco, Phelps-Dodge, and Taseko claims. Hycroft, Molycorp., Pegasus, and Santa Fe may propose some additional exploration also. As with the current exploration activities, TSP emissions are expected to be minimal.

Atlas' new point sources of air pollutants would include the oxidation pretreatment circuit, combustion of diesel fuel in the additional haul trucks and other additional equipment, and fuel combustion in the new diesel generator, which would supply power for the buildings and facilities in the new mine area. All of these emissions would be expected to be minimal when compared to the dust emissions.

The proposed mining operations at Atlas and exploration at Atlas and other claims would result in supplementary emissions of total suspended particulates (TSP) as well as minor amounts of gases including nitrogen oxides (NOX), hydrocarbons (HC), carbon monoxide (CO), and other gases.

PARTICULATE EMISSIONS

With the exception of emissions from the proposed stationary diesel generator at the Atlas Gold Bar expansion, all of the additional particulate emissions due to the proposed operations would be mobile point source or fugitive emissions. Drilling and blasting for ore in Atlas' three proposed pits would be continual throughout the mine life. The drilling, blasting, loading, hauling and unloading of ore and waste rock would be expected to be fairly uniform from year to year over the mine life. Given this proposed mining schedule, the fugitive particulate emissions due to these operations would be expected to be fairly uniform over the mine life. Fugitive particulate emissions associated with the proposed exploration activities would also be fairly uniform over time. All of the exploration activities are limited such that the associated emissions would be on a short-term basis only.

Since the mining operations at the Gold Bar facility would be terminating soon after the proposed project commenced, the additional impact with respect to fugitive particulate emissions would be minimal. The primary difference which would cause an increase in particulate emissions when compared to those at the Gold Bar site would be the greater distance of ore haulage. The greater mine area and the larger numbers of equipment would also contribute to an increase in particulates.

The primary source of fugitive particulate emissions due to Atlas mining activities would be the loading of the ore and waste rock in the pits. These emissions are estimated to be on the order of 255 tons per year (TPY) of total suspended particulates less than 30 microns in diameter (TSP 30). This estimate is based upon an emission factor of 0.037 pounds per ton (EPA, 1985) and an operating period of 6,240 hours per year. Due to both controls and the nature of the operations, the magnitude of particulate emissions due to drilling, blasting, hauling to the dumps, waste unloading and wind erosion of dump surfaces is not expected to be near that of waste rock loading. Instead, these operations are expected to emit a combined 65 tons or less of particulates (TSP 30) annually. The total mine-related TSP emissions at the Goldstone, Gold Pick and Gold Ridge area of about 320 TPY are compared to the estimated 161 TPY for the existing Gold Bar mining operations. The net increase is 159 TPY or about 100 percent. Since Gold Bar mining will be discontinued by the middle of 1990, though, the 161 TPY of emitted particulates will no longer exist. Total suspended particulate emissions would create air quality impacts primarily only during the life of the proposed project. Dust emissions would be controlled with water for the life of the mines.

The controlled TSP emissions from hauling the Goldstone, Gold Pick and Gold Ridge ore to the proposed leach pad and the existing mill are estimated to be 326 TPY. Since hauling of ore from the Gold Bar pit would almost completely cease, this estimate represents the cumulative ore-haulage emissions. The total additional fugitive TSP emissions due to all mining and hauling at the Goldstone, Gold Pick and Gold Ridge operations are estimated, therefore, to be 646 TPY (320 TPY from mine-related activities plus 326 TPY from ore haulage). Table 12 summarizes these estimated emissions.

TABLE 12: EXISTING, PROPOSED, AND CUMULATIVE TSP EMISSIONS DUE TO ATLAS MINERALS GOLD BAR OPERATIONS AND PROPOSED EXPANSION.

LOCATION	EXISTING EMISSIONS (tpy)	PROPOSED EMISSIONS (tpy)	CUMULATIVE EMISSION (tpy)
Satellite area	0	320	320
Gold Bar area(a)	161	326(b)	326(c)
			total = 646

a - includes haul road between Satellite and Gold Bar areas
b - ore haulage from Satellite area
c - after Gold Bar emissions (161 TPY) cease

Following cessation of mining, the TSP emissions would be minimized. There would be some dust emitted during final regrading and reclamation activities and lesser amounts from disturbed surfaces until vegetation becomes established.

Point source particulate emissions from the proposed diesel generator at Atlas' Satellite area would be expected to be minimal during operations, and nonexistent after operations are complete.

Experience with Atlas' present tailings pond indicates that there should be no trouble keeping the tailings in the proposed tailings pond expansion sufficiently wet to prevent dusting during operations. Subsequent reclamation would prevent dusting after vegetation becomes established.

Past estimates of the air impacts for the present processing operations has indicated that the State air quality standards would not be exceeded in areas available to the public. This is also expected to be the case for the proposed mining operations. The State excludes mining fugitive emissions from its permitting regulations but does include them in assessing monitored compliance with the air standards.

Fugitive dust emissions would occur from proposed exploration activities at the various claims within the CAR area. Table 13 summarizes the estimated emissions due to wind erosion of unprotected surfaces associated with acreages disturbed at each claim proposing further exploration. These calculations are based on the EPA emission factor of 0.38 tons of TSP emitted per acre per year (EPA, 1985).

TABLE 13: TSP EMISSIONS ASSOCIATED WITH PROPOSED EXPLORATION ACTIVITIES IN THE CAR AREA.

COMPANY	ACTIVITIES	DISTURBED ACREAGE	ESTIMATED TSP EMISSIONS(1)
Atlas - Lonewhip		3 acres	1.14 TPY
Gexa	drilling	3 acres	1.14 TPY
Nerco	road construction drilling	3.5 acres	1.33 TPY
Pegasus		2.5 acres	0.95 TPY
Phelps-Dodge	drilling	19 acres	7.22 TPY
Taseko	drilling	<1 acre	<0.38 TPY

1 - emissions due to wind erosion of unprotected surfaces only

GASEOUS EMISSIONS

The sources of additional hydrocarbon (HC), nitrous oxides (NOX), and carbon monoxide (CO) emissions due to the proposed Atlas expansion would be the combustion of diesel fuel in the mobile mining equipment as well as in the diesel generator. As with the particulate emissions, once Gold Bar production has ceased, gaseous emissions are expected to remain roughly the same as those produced during Gold Bar operations. However, since the haul road from the proposed pits to the existing mill is considerably longer than the distance between the Gold Bar pit and the mill, additional haul trucks operating hours are anticipated to produce a net increase in exhaust emissions. Use of this equipment would produce additional HC, NOX, and CO emissions.

Gaseous emissions due to the proposed exploration activities in the CAR area would not be expected to increase. All gaseous emissions are expected to impact air quality only on a local and short-term basis and to be within State ambient air quality requirements.

Since the mill-grade ore from the Atlas Gold Pick, Gold Ridge, and Goldstone pits would be processed in the existing Gold Bar mill, emissions would continue to be controlled in the same manner under which each source has been permitted. These emission controls include baghouses for particulate emissions the remelting and tilting furnaces, the lime storage silo, and the Ca(CN)2 (calcium cyanide) storage bin. Mercury emissions from the mercury retort would continue to be controlled with the use of a 99% efficient condenser. Fugitive particulate emissions due to the handling, transport, and storage of any materials would continue to be controlled through watering or chemical stabilization. These emission controls represent best demonstrated technology and no other mitigation is necessary.

Upon closure, wind erosion of the waste rock dumps would be controlled due to reclamation efforts. Topsoil would be placed on the dumps and the areas would be revegetated. Wind erosion of the main haul road would also decrease because the road would be reduced from its wide haul road configuration to that of a permanent, one-lane access road. The surface of this road would be compacted, leaving a solid surface less prone to erosion. Emissions from the leach heaps would not be a concern during operations due to constant wetting with the leach solution. Upon closure, the leach heaps would be revegetated which would minimize future particulate emissions. Likewise, the tailings pond would be revegetated, which would minimize future particulate emissions. No other mitigation is required.

Mitigation of air emissions due to exploration activities would include watering of roads and water sprays used during drilling. Reclamation of disturbed areas as soon as possible after use would be the primary mitigation necessary to minimize and eventually eliminate dust emissions due to wind erosion.

VISUAL RESOURCES

The BLM's visual resource management classes are essentially promulgated through Resource Management Plans (RMPs). Management decisions, within the framework of the RMP procedures, determines the assignment of visual management classes. Throughout the RMP process the value of visual resources must be considered, and any impacts that a proposed project may have on such resources must be addressed. Some management decisions, therefore, are directly affected by the value of specific visual resources. A case in point could be a highly scenic area which may be designated as VRM Class I.

In developing VRM classes, visual resource inventories are conducted through the management process. A Class I may be assigned to an area where the natural landscape is to be maintained (i.e. national wilderness area or wild and scenic views). The remaining Classes II, III,and IV are based on combinations of scenic quality, sensitivity levels and distance zones. The classes are graphically depicted on map overlays. To achieve Visual Resource Classes, specific objectives must be met. For example, the Class II objective is to retain the existing character of the landscape. The level of change due to the project should be low or minimal. The casual observer should be able to view the management activities without undue concern. And any changes must adhere to basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.

The Roberts Creek study area encompasses Class II visual resources for approximately sixty percent of the study area. As stated previously, the Class II objective is to basically maintain the existing character of the landscape prior to any modifications by a project. In this case, the project, or projects, are activities associated with mineral mining (i.e. primarily gold and silver). Associated with such mining activities would be the construction of roads, borrow pits, leach pads, ponds, drainage channels, buildings and other structures.

WATER RESOURCES

The water resources of the Roberts Mountains and surrounding areas are comprised of perennial, ephemeral, and intermittent streams, springs, seeps, ponds, reservoirs, and wells.

Average annual precipitation (6-8 inches) occurs in the form of rain at lower elevations and snowfall at elevations of approximately 4,000 feet. Most of the moisture occurs between the months of November and April. However, thunderstorm activity (July through September) can create intense, short-duration storms which may produce severe flash-flooding and debris flows within the primary and secondary drainages.

The major streams - Roberts Creek, Vinini Creek, Pete Hanson

Creek, Birch Creek, Willow Creek, and Tonkin Spring/Creek are all considered important drainages for fisheries, wildlife habitat and visual resource values. The BLM has promulgated Riparian Management Objectives (RMOs) to improve stream conditions, and these include fencing, streambank stabilization, instream structures implacement, etc. These streams are being considered for improvement under the RMO program, due to problems primarily associated with livestock overgrazing. Heavy use of these watersheds by livestock may cause soil compaction, streambank sloughing, destruction of riparian vegetation, increased turbidity, high coliform bacteria levels, higher water temperatures, and reductions in dissolved oxygen. All of these factors can have negative effects on water quality, and subsequently reduce the beneficial uses of the water resource (e.g. fisheries, wildlife, recreation, mining, etc.).

The Roberts Creek drainage originates near the center of Roberts Mountain and flows south through approximately eight miles of BLM administered lands before diversion to the Roberts Creek Ranch for irrigation. Consistent streamflows occur annually, supporting populations of rainbow, brook and brown trout. Riparian vegetation and streambank stability are in poor to fair condition along significant lengths of the drainage due to livestock overgrazing.

Vinini Creek also begins near the center of Roberts Mountain and travels east over five miles of BLM land prior to flowing into Garden Valley. Upper sections of the stream are in fair condition, while overgrazing and road construction have deteriorated the lower areas.

Pete Hanson Creek flows out of the north-west section of Roberts Mountain through approximately 4.4. miles of BLM land where it is diverted to Tonkin Ranch in Denay Valley. Currently, the stream is in fair to good condition.

Willow and Birch Creeks both commence in the north-central area of Roberts Mountain, flowing generally north, over about 5.5 miles of BLM land, and then being diverted at Willow Creek Ranch. Birch Creek is in good condition, but ephemeral. Willow Creek is in fair condition, but cannot sustain fish populations due to periodic low flows. Livestock overgrazing and resultant damage are light to moderate along Birch Creek, while heavy grazing and trampling are evident along the upper sections of Willow Creek, especially adjacent to springs and seeps. Fencing on private lands has prevented livestock degradation in the lower canyon areas.

Tonkin Spring is located in the northwest section of Roberts Mountain and flows through .75 miles of BLM land and .25 miles of private land, termination at Tonkin Reservoir. The water is of high quality, and could support a significant fishery if protective fencing and instream structures are utilized.

The remaining streams in the study area are Henderson Creek, Niel Creek, Kelley Creek, Denay Creek and Coils Creek. The water flows are mostly intermittent, and livestock utilization has resulted in light to moderate trampling and competition along some sections of the drainage.

Under the provisions of the Federal Clear Water Act of 1977, and the provisions of the Federal land Policy and Management Act of 1976, the BLM is required to comply with the State of Nevada's water quality management and implementation plan. To meet these requirements, the BLM has agreed to: (1) continue to develop pollution control and abatement programs which provide for both environmental protection and reasonable resource uses on BLM-administered lands; (2) whenever appropriate, institute best management practices and employ other necessary plans and permit requirements in the development of management framework plans, allotment management plans and control of nonpoint source pollution from public lands and; (3) develop and institute a "208" water quality monitoring and survey program and; (4) upon request, provide the Division of Environmental Protection (DEP) with any available water quality data gathered by the BLM (Annual Water Quality Analysis Report for Nevada, 1984).

Management decisions concerned with the beneficial use of water (e.g. mining, recreation, livestock, fisheries, wildlife, etc.) will benefit from a better understanding of actual water quality parameters, relative to state and federal standards. Most of the streams in the study area have been sampled at some time in the past (see - Annual Water Quality Analysis Report for Nevada, 1984; Water Quality Testing for the Nevada BLM Water Environmental Statement, 1979; Bureau of Land Management, Battle Mountain District, Eureka Planning Unit, Water Quality Analyses, 1977). Samples were analyzed for a number of water quality parameters (e.g. dissolved oxygen, turbidity, dissolved solids, coliform, bacteria etc.). Even though the samplings have been limited in number, and not consistently obtained over a reasonable time frame, specific trends are evident. Most of the streams exhibit high turbidity, elevated dissolved solids, higher temperatures and increased coliform bacteria levels. These problems are primarily attributable to livestock grazing within the drainages, and the lack of adequate management and remedial measures. Riparian Management Objectives (RMOs) must address these problems, and further, consider potential impacts associated with the proposed increase in mining activities within the watersheds.

Planned mining activities will include exploratory programs (drilling and sampling) which may require the construction of new roads and drill pads, or at the very least, four-wheel vehicle transit through previously undisturbed areas. Operational mines and attendant facilities will necessitate the construction of roads, pits, leach pads, ponds, wells, buildings and equipment, etc.). Severity of impacts on surface water of streams, ponds, reservoirs and springs will be related, more or less, to the proximity of these activities to the water resource. Impacts will be associated with surface runoff (especially during thunderstorms) from disturbed areas (i.e. roads, pits, pads, etc.) and possible leakage or overflow from ponds and leach pads.

Mitigation measures will include the construction of berms and diversion channels to direct runoff away from natural drainage and other water resources, and the revegetation of highly erodible cut and fill areas. The use of properly installed culverts and diversion channels may minimize runoff and erosion from roads. Also, revegetation may be necessary in more highly erodible locations.

Contamination of groundwater systems may be reduced through sound design and construction techniques for leach pads, ponds and borrow pits.

Consumptive use of water for mining operation (i.e. cyanide heap-leaching, ponds, watering of roads, etc.) may impact surface water flows, and groundwater systems, where the wells are located within close proximity to major stream drainages, and aquifers which feed streamflows.

SURFACE WATER

GENERAL DESCRIPTION

The study area includes all streams which drain out of the Roberts Mountains and into the surrounding valleys. Roberts Creek is the major stream draining the south half of the Roberts Mountains. Denay Creek drains the northwest corner of the range, and Coils Creek drains the western part of the Roberts Mountains. The northwestern part of the project area is located within the Simpson Park Mountains. Tributaries to Coils and Denay Creeks drain that area. Other important streams in the project area include Rutabaga Creek, Henderson, Vinini, Willow, Pete Hanson, and Red Creeks.

Roberts, Rutabaga, and Coils Creeks flow generally south and are tributary to Slough Creek, which terminates in Diamond Valley, which is a closed valley. Red Canyon Creek drains north to Denay Creek which continues northeast through Denay Valley, which then continues into Pine Valley. Pete Hanson and Willow Creeks also drain north to Denay Valley. Henderson and Vinini Creek drain east, then north out of the Roberts Mountains toward Pine Valley, which is a tributary of the Humboldt River. Drainage boundaries of watersheds in and near the area are shown on Figure x.

Roberts Creek is a perennial stream which drains the east side of the Roberts Mountains. It flows generally south, and perennial flow ceases as the stream flows across the porous alluvium of Kobeh Valley toward its confluence with Slough Creek. Roberts Creek generally exhibits perennial flow above 6,400 feet elevation and seasonally intermittent flow below 6,400 feet. Only during significant storm events, or during spring runoff does Roberts Creek contribute flow to Slough Creek. A small reservoir is located on Roberts Creek near the canyon mouth.

Coils Creek is an intermittent drainage with its headwaters located in the Simpson Park Mountains. Tributaries to the west of Coils Creek originate in the Simpson Park Mountains and those to the east drain the Roberts Mountains. Tributaries within the study area include: Dry Creek, Jackass Creek, Meadow Creek and Cottonwood Creek. Most of these tributaries are spring-fed, but Cottonwood Creek is the only one in the project area which produces perennial flow for any distance down the canyon. Meadow and Jackass Creeks appear to be intermittent streams, experiencing surface flow for several months of the year, and interflow for much of the remainder of the year. Dry Creek appears to be ephemeral, flowing only in response to snowmelt or thunderstorms. Flow from these streams enters Coils Creek only during spring snowmelt, or occasionally during thunderstorm runoff. Most of the year, flow infiltrates into the alluvium beyond the canyon mouth before it reaches Coils Creek. As Coils Creek flows south, it bisects Atlas' existing Gold Bar mine area, separating the tailings pond from the main mine and processing area. It then continues south through Kobeh Valley.

Between Coils and Roberts Creeks, the major drainage is Rutabaga Creek. It is an ephemeral-to intermittent stream with two small springs contributing to its flow. In addition, several small ephemeral drainages flow south out of the mountains between Coils and Roberts Creek and into the Kobeh Valley. These channels rarely experience flow, and even more rarely contribute flow to either Coil or Roberts Creek.

Henderson Creek is east of the Roberts Creek drainage. It is spring-fed in its headwaters and in much of Garden Valley, but experiences only intermittent flow for a short distance in between as it enters the alluvial materials at the base of the mountains. Henderson Creek flows out of the Roberts Mountains and heads north through Garden Valley along the Sulphur Springs Range. Vinini Creek is tributary to Henderson Creek, and is a perennial stream for much of its length.

Streams draining the northern section of the Roberts Mountains are Gabel, Dry, Willow, Birch, Kelley, Niel, Pete Hanson and Red Creeks. Willow, Birch, Kelley, and Pete Hanson Creeks experience perennial flow for significant distances; the remainder experience flow only intermittently. Red, Pete Hanson and Willow Creeks are the largest of the these streams in the northern Roberts Mountains. Red Canyon flows north about 6 miles before entering Denay Creek, which sustains perennial flow until in reaches Denay Valley. The remaining streams drain to Denay Valley and likely only reach Denay Creek during extreme runoff events. During much of the year they likely infiltrate quickly into the alluvial Denay Valley materials.

STREAM FLOW

Long-term stream gaging has not been done on any of the streams on Roberts Mountain or its vicinity, so modeling was used to characterize streamflow. Peak flow calculations were done for drainage areas under storm conditions. Storm events chosen for the modeling were the 10-year, 24-hour, the 25-year, 24-hour and the 100-year, 24-hour storms. An SCS Type II storm distribution was used for total rainfall depths of 2.2, 2.6 and 3.2 inches for the 10-, 25- and 100-year events, respectively. These depths were obtained from the NOAA Atlas for Nevada (Miller et. al, 1973). The SCS Curve Number/unit hydrograph method was used for the analysis (SCS, 1972). Curve Numbers were derived for each watershed based upon soil characteristics, vegetative type and condition. Table 14 gives calculation results and watershed information.

TABLE 14: PEAK FLOWS AND CHARACTERISTICS OF SELECTED DRAINAGES.

Drainage ID	Area (acres)	Curve Number	Peak from 10yr-24hr (cfs)	Peak from 25yr-24hr (cfs)	Peak from 100yr-24hr (cfs)
Coils	49,400	72	2150	3440	5400
Dry Canyon	1,120	71	150	270	480
Jackass Ck.	1,440	73	240	400	680
Meadow Ck.	3,200	69	240	430	670
Cottonwood Ck.	3,270	67	130	250	400
Rutabaga Ck.	4,800	70	410	720	1310
Roberts Ck.	14,400	67	640	1210	2360
Henderson	9,400	72	1060	1800	3120
Vinini	6,700	73	740	1220	1060
Willow	3,830	69	330	600	1150
Pete Hanson	4,780	70	420	750	1370
Red Canyon	8,770	73	1120	1840	3130

Limited water quality information on Roberts Creek, Coils Creek, Jackass Creek, Cottonwood Creek, and Vinini Creek has been compiled from a BLM sampling program in 1977, 1979, and 1982, and Atlas sampling in 1989. This information is shown in Table 15, Table 16 and Table 17 below. As the tables show, water is generally of calcium-bicarbonate type, and is chemically suitable for drinking use. However, coliform counts exceed drinking water standards. Roberts Creek has been designated as a Class A Waters by the State of Nevada, which means that water quality must be maintained at high levels.

TABLE 15: SURFACE WATER QUALITY, 1977-1979*

Parameter	1** Coils Creek	2 Cottonwood Creek	3 Roberts Creek	4 Roberts Creek	5 Vinini Creek
Temperature (oC)	20	16	15	16	14
pH	9.8	8.6	8.3	8.4	8.0
Turbidity (NTU)	2.46	12.0	2.25	11.0	6.28
TDS (mg/l)	204	261	185	292	193
Nitrate (mg/l)	0.02	0.24	0.34	0.09	0.56
Phosphate(mg/l)	0.52	0.38	0.28	<.01	0.51
Chloride (mg/l)	18.1	18.3	14.2	6.5	13.7
Calcium (mg/l)	29	63.4	37.1	74	32.6
Manganese (mg/l)	<.02	<.02	<.01	0.04	<.01
Potassium (mg/l)	5.29	3.2	2.79	2.4	3.61
Sodium (mg/l)	28	15.2	5.78	14	13.4
TSS (mg/l)	9	6	---	47	---
Sulfate (mg/l)	18.4	32	13.8	25	26
Bicarb (mg/l)	139	212	208	192	223
Carbonate (mg/l)	24	33	0	8	8

*From an average of up to four samples taken between 1977 and 1979 (Davis Laboratory, 1979).
** Map identification number on Figure x.

TABLE 16: SURFACE WATER QUALITY, 1977 AND 1982*

Parameter	5** Vinini Creek	6** Upper Vinini Creek	5*** Vinini Creek	1*** Coils Creek
pH	8.0	7.8	8.0	7.8
Turbidity (NTU)	2.1	0.6	57	5.4
TDS (mg/l)	239	344	274	276
Nitrate (mg/l)	0.06	0.07	0.06	----
Phosphate(mg/l)	0.01	0.01	0.04	----
Chloride (mg/l)	4.5	12.0	12	23
Calcium (mg/l)	47	75	44	40
Manganese (mg/l)	<.02	<.02	.09	----
Potassium (mg/l	2.5	3.4	2.7	4.9
Sodium (mg/l)	11	22	15	27
TSS (mg/l)	11	2	---	----
Sulfate (mg/l)	37	63	51	35
Bicarb (mg/l)	152	196	165	168
Carbonate (mg/l)	0	0	0	0

*From data by Chinook Research Labs (1982), and Sierra Environmental Monitoring (1977)

** From samples taken in 1977.

*** From samples taken in 1982.

Note: Numbers at head of columns represent map identification number on Figure x.

TABLE 17: SURFACE WATER QUALITY - MARCH 21, 1989

Parameter	3* Roberts Creek	7 Roberts Creek
pH	8.3	8.3
TDS (mg/l)	289	292
Bicarbonate (mg/l)	230	240
Conductivity (umhos/cm2)	575	575
Sodium (mg/l)	13	13
Calcium (mg/l)	68	69
Magnesium (mg/l)	19.2	19.6
Iron (mg/l)	0.03	0.06
Manganese (mg/l)	<.02	0.04
Arsenic (mg/l)	0.004	0.004
Chloride (mg/l)	14	14
Nitrates (mg/l)	0.9	0.5
Copper (mg/l)	<.02	<.02
Zinc (mg/l)	<.01	<.01
Cadmium (mg/l)	<.01	<.01
Selenium (mg/l)	<.005	<.005
Mercury (mg/l)	<.0005	<.0005
Chromium (mg/l)	<.02	<.02
Silver (mg/l)	<.02	<.02
Lead (mg/l)	<.05	<.05
Boron (mg/l)	0.1	0.1
Nickel (mg/l)	<.03	<.03
Aluminum (mg/l)	<.02	<.02

* Map Identification number on Figure x

GROUNDWATER

The principal groundwater resources near the study area are contained in the alluvial materials at the base of the Roberts Mountains in Kobeh Valley, Denay Valley and Garden Valley. The aquifers are composed of older (Quaternary- to Tertiary-aged) alluvium and younger alluvium in the southern part of the valley.

The aquifer in Kobeh Valley is recharged mainly from precipitation in the surrounding mountains, including the southern Roberts Mountains, and the eastern Simpson Park Range. Significant underflow from Monitor Valley also contributes to groundwater in Kobeh Valley. The alluvial aquifer was studied by the State of Nevada in 1964 as part of its water resources appraisal project (Rush and Everett, 1964). During this study, the Kobeh Valley aquifer was determined to have about 2.7 million acre-feet of water in storage in the upper 100 feet of alluvial materials. The total estimated annual recharge is 16,000 acre-feet. Natural discharge was estimated to be about 15,000 acre-feet per year. Pumping amounts have varied over the past years, with the major users currently being the nearby ranch and Atlas Gold Mining, Inc. at the Gold Bar operation. The Gold Bar operation currently has rights to 1,218 acre-feet per year.

The alluvial aquifers in Denay and Garden Valleys drain to the Pine Valley groundwater basin. Details recharge to the Pine Valley aquifer would be mainly precipitation from the northern Roberts Mountains, Cortez Mountains, Sulphur Springs Range and Pinyon Range. Discharge would be pumping, spring discharge, and evapotranspiration. US Gold uses somewhat less than 400 gpm of groundwater pumped from a well on their mine site.

The alluvium thickness increases from the mountain flanks to the valley floors. Near the existing Gold Bar Mine site, the alluvium is estimated to be 600 to 800 feet thick. Water levels measured in existing Gold Bar wells indicate that the static water level is between 125 and 175 feet below ground surface (or an elevation of about 6,250 feet). At a BLM well about 3/4 mile to the southeast, water level was measured at 50 feet below ground surface (6,182 feet elevation) (Bunch and Harrill, 1984). Northwest of the Roberts Range, at Tonkin Spring near the US Gold operation, the discharge elevation is 6,560 feet. At the Roberts Creek Well, depth to water has been measured at between 115 to 140 feet (Bunch and Harrill, 1984, and Rush and Everett, 1964), or 6,360 to 6,335 feet elevation. At Three-Bar Ranch north of the Gold Bar operations, depth to water has been measured at 7 feet deep, or an elevation of 6,533 (Bunch and Harrill, 1984).

Localized, perched aquifers are found in the bedrock of the Roberts Mountains. These perched aquifers surface as springs feeding streams that issue from the mountains. Within the Roberts Creek mountains themselves, little groundwater has been found. Exploration drill holes in Atlas' Satellite area have encountered only small amounts of water. It is not known whether other exploration companies have encountered water in their drill holes. However, springs commonly issue from the fractured consolidated rocks. These are intermittent, and rate of flow is low (Rush and Everett, 1964). They likely represent small, localized, perched aquifers, and are not an economic groundwater source.

Water quality of both the springs in the localized bedrock aquifers and groundwater from wells in the alluvial aquifer is generally very good, and is suitable for most uses, including drinking. Table 18 shows results of water sampling done by the BLM between 1977 and 1979. These are representative of water in the bedrock perched aquifers. Table 19 shows results of water sampling done for Atlas in 1985 and 1989 at wells in the alluvial aquifer. Both aquifers appear to be of a calcium-bicarbonate type, and quite similar in other constituent concentrations.

TABLE 18: 1977 AND 1979 GROUNDWATER QUALITY

Parameter	8** Cottonwood Spring	9 Tonkin Spring	10 Roberts Spring	11 Roberts Spring*	12 Jackass Spring*
Temperature (oC)	15	13	---	10	18
pH	7.8	8.0	7.7	8.0	8.3
Turbidity (NTU)	1.1	0.39	0.3	0.7	1.0
Dissolved Solids (mg/l)	310	211	477	273	
Nitrate (mg/l)	0.21	0.59	0.24	0.87	0.81
Orthophosphate (mg/l)	0.02	0.17	<.01	0.42	0.45
Chloride (mg/l)	5.5	10.9	9.08	23.3	
Calcium (mg/l)	84	36.6	33.9	42.6	
Manganese (mg/l)	<.02	<.01	<.01	<.01	
Potassium (mg/l)	2.1	2.70	2.43	5.08	
Sodium (mg/l)	15	5.34	2.5	30.9	
Suspended Solids (mg/l)	6	---	----		
Sulfate (mg/l)	43	20	10.8	36	
Bicarbonate (mg/l)	214	233	175	223	
Carbonate (mg/l)	0	12	0	13	

* Average of three samples.

** Map identification number on Figure 3.

TABLE 19: 1985 AND 1989 GROUNDWATER QUALITY

Parameter	9** 9/19/85 Water Supply Well	9 3/22/89 EW-2
pH	7.6	8.4
Conductivity	---	450
Bicarbonate (mg/l)	139	126
Carbonate	---	6
Dissolved Solids (mg/l)	241	250
Nitrate (mg/l)	2.3	2.5
Phosphorus (mg/l)	0.44	---
Chloride (mg/l)	17	17
Arsenic (mg/l)	0.00	0.004
Barium (mg/l)	<.4	<.4
Cadmium (mg/l)	<.01	<.01
Calcium (mg/l)	44	49.4
Chromium (mg/l)	<.02	<.02
Copper (mg/l)	<.02	<.02
Iron (mg/l)	<.02	0.03
Lead (mg/l)	<.05	<.05
Magnesium (mg/l)	6.5	6.2
Mercury (mg/l)	<.0005	<.0005
Manganese (mg/l)	----	<.02
Potassium (mg/l)	3.5	3.8
Selenium (mg/l)	<.005	<.005
Silver (mg/l)	<.01	<.02
Sodium (mg/l)	21	26
Zinc (mg/l)	<.01	0.02
Cyanide WAD (mg/l)	<.005	<.005
Sulfate (mg/l)	32	29
Fluoride (mg/l)	0.2	0.2
Silica (mg/l)	27	----

Note: Well EW-2 is 25 feet south of water supply well.

SURFACE WATER RESOURCES

Net peak flows for the 10-, 25-, and 100-year, 24 hour precipitation events for the major drainages have not been noticeably increased by mining-related activities, nor should they be due to future activities. The disturbed areas do cause locally-increased runoff, but due to their small proportional area to the entire watersheds, this increase is not seen at the drainage outlet.

Water usage for exploration companies occurs during field drilling seasons. Some of this usage is from springs and streams within the Roberts Mountains, but amounts used are presumed to be insignificant.

The potential for mining operations to contaminate surface water sources exists due to use of hazardous materials such as cyanide that are using in the processing of gold. However, Atlas and U.S. Gold, as current operators, have spill prevention and control plans in affect which make this possibility unlikely. In addition, their process solutions are used and stored away from perennially flowing water, so impacts in the event of a spill would not likely be great. Other companies would also be required to have similar spill plans if they began processing of ore. However, if these operations were located near perennial streams such as Roberts Creek, Willow, Pete Hanson or Cottonwood Creek, impacts from a spill would be greater.

Increased sediment is contributed to watersheds due to removal of vegetation and subsequent greater runoff from dump and road surfaces. Using the Universal Soil Loss Equation (USLE), sheet erosion from waste dumps is estimated to be approximately 100 tons/acre/year. The total soil loss from Gold Bar dump slopes is calculated to be on the order of 2,100 tons/year during the operational phase; the total from the Tonkin Mine dump slopes is on the order of__a__(**multiply 100 x area of dump slopes**). The extensive exploration road network in the area currently results in erosion of about 700 tons annually, for a total current sheet erosion rate of close to__b___ **(add 2100 + 700 + a)** tons per year. An undetermined amount of the eroded materials would eventually be transported to Coils, Red, Niel, Pete Hanson, Rutabaga, or Roberts Creeks.

Atlas' proposed operations would result in a sheet erosion rate on the order of 100 tons/acre/year for all dump slopes, as calculated by the Universal Soil Loss Equation (USLE). At the maximum level of dump disturbance, this would result in an erosion rate of approximately 15,000 tons/year. In other years, this rate would be less. Sheet erosion from Atlas' and other companies' proposed road surfaces would be approximately 1000 tons/year, making the total future sheet erosion approach 16,000 tons per year. (However, it is unlikely that all of this disturbance would occur over a given year. More likely, some of this would not begin until other areas have been reclaimed, so erosion in a given year would be less than the amount stated above.) Again, some of this eroded material would likely be transported to streams in the area. However, Atlas, which is the major cause of future disturbance, would install and maintain sediment control structures, greatly reducing potential for stream sedimentation.

Total calculated sheet erosion from all current- and proposed dump and road areas is on the order of___ **(add 16,000 + b)** tons per year. Most of this erosion would not enter a stream system, either due to sediment control structures or natural deposition. A certain portion may reach streams however, and impact riparian areas and stream substrate. The BLM has riparian management goals for most of the streams in the area. The most extensive plan, for Roberts Creek, would not be impacted by the major operator in the area (Atlas) since the plan for stream management begins upstream of Atlas' activities.

Impact on other riparian areas due to exploration by other operators cannot be determined at this time since details on road alignment are not known. However, some of the ongoing and proposed activity is located near streams and this activity would be more likely to cause stream sedimentation and riparian impacts than other activity further from water courses. Nerco, Pegasus and Atlas' Wildflower activities are located close to Roberts Creek. Hycroft and Gexa have claim blocks in the headwaters of Red Canyon; Nerco, Phelps Dodge and Atlas have claim blocks adjacent to Cottonwood and Meadow Creek; Pegasus, Taseko and Asarco have claim blocks near Pete Hanson Creek; Atlas, Asarco and Gexa have claim blocks near Willow Creek; and Molycorp has a claim block which encroaches upon the Coils Creek channel.

GROUNDWATER RESOURCES

Atlas currently has permits to withdraw up to approximately 1,218 acre-feet of groundwater per year from wells near the Gold Bar Mine, in the Kobeh Valley aquifer. Additional amounts of groundwater currently used by other exploration companies are assumed to be negligible. The total yield of the aquifer from which the withdrawal occurs has been estimated to be 16,000 acre-feet/year, and existing withdrawals are much less than this, so the withdrawal of 1,218 acre-feet annually would be considered negligible.

U.S. Gold currently withdraws about 400 gpm (640 acre-feet per year) from the Denay Valley aquifer. Information on yield is not available, but 400 gpm withdrawal is probably insignificant.

Atlas' future operations would result in the withdrawal of an additional 172 acre-feet/year of groundwater from the upper-gradient portion of the Kobeh Valley alluvial aquifer. After nine years of continuous pumping at 106 gpm, drawdown at the nearest well would be less than 0.3 feet. The water level would soon recover after pumping ceases. This potential amount of short-term drawdown would not be significant.

Groundwater quality impacts to the alluvial aquifer are currently negligible. Depths to groundwater exceed 100 feet in the vicinity of both U.S. Gold's and Atlas' leach pads and tailings pond. They are designed according to NDEP requirements to prevent groundwater contamination, and would be monitored to insure effectiveness of designs. This would also apply to new leach pads under Atlas' future expansion.

Short- and long-term impacts to water quality or quantity of the small bedrock aquifers in Atlas' Gold Bar expansion area would be negligible. No springs would be disrupted by pits or dumps, and groundwater would not be expected to be encountered in pit bottoms. No drill holes intercepted water, indicating that the potentiometric surface is below the pit bottom. In addition, any runoff to the pits, as well as precipitation on the pit surfaces would rapidly infiltrate and/or evaporate due to the porosity of rock in the bottoms.

Exploration activities normally do not have an impact on groundwater resources and none have been documented or are expected to occur due to existing or planned drilling in the area. However, if mine development occurs in the future on claims blocks which are close to streams, impacts to groundwater may occur. The potentiometric surface is near ground level adjacent to the streams and pits would likely encounter groundwater, requiring continual dewatering. Leach pads and tailings ponds would have the potential to impact groundwater quality in these shallow groundwater areas if stringent design guidelines are not enforced.

Cumulative impacts to groundwater would be related to total water withdrawal of 1,390 acre-feet per year from the Kobeh Valley aquifer - which is small compared to the total yield of the aquifer, and 640 acre-feet per year from the Denay Valley aquifer. This would only last during operations, and water levels would recover shortly thereafter.

SOCIOECONOMICS

The socioeconomic profile presented here describes the primary location of impacts to various communities. Potential problems were analyzed by evaluating the impacts of anticipated employment, housing, and revenues from the project on the existing conditions of these locations. Socioeconomic information is presented for the Eureka area. A brief socioeconomic summary is also presented for the Elko/Carlin and Battle Mountain areas. A more detailed categoric summary for Elko/Carlin and Battle Mountain is presented in Appendix 3.

Table 20 gives employee status, wage, and housing information specifically for the Roberts Mountains region for the mining companies associated with the CAR.

TABLE 20: EMPLOYMENT, INCOME, AND HOUSING

Company	Employment	Average salary	Accommodations
GEXA	1 geologist part-time	$2500/mo	Eureka,Nv.
Hycroft	2 permanent geologists (May-Oct.)	$3000/mo	Eureka, Elko, or
	1 temporary geologist (May-Oct.)	$2000/mo	Tonkin man camp
U.S. Gold	23 permanent geologists	$29,000/yr	5 stay at Tonkin man camp, the rest in Eureka
	4 temporary geologists	?	
	100 construction workers		housed at Tonkin man camp
U.S. Borax	no employees		
Phelps-Dodge	1 permanent employee (works 4 months/yr)	$40,000/yr	Eureka, Nv.
	1 temporary employee	$27,000/yr	Eureka, Nv.
Taseko Mines, LTD	no employees		
Pegasus	no employees		
NERCO	2-3 permanent employees (work 10 months/yr)	?	Eureka, Nv. Hunter Claims man camp
ASARCO	2 permanent employees for 4 months	$2,500/mo	Eureka, Nv.
	2 temporary for 4 months	$2,000/mo	Eureka, Nv.
Santa Fe	2 permanent for 1 month	$250.00/day	Eureka, Elko
	1 temporary for 1 month	$150.00/day	
Atlas	3 permanent employees	$50,000/yr	Eureka, Nv.
	1 permanent employee (works 4mo/yr)		Eureka, Nv.
	3 temporary employees	$2,000/mo	Eureka, Nv.

EUREKA

POPULATION

Eureka County is located in a sparsely populated area of central Nevada. Historically, this area has had very large fluctuations in population ranging from over 9,000 during the mining activity of the late 1800's to approximately 750 in the late 1950's. Since 1960, the population has steadily risen to an estimated 2,007 in 1988 (Table 21). The increasing trend in population reflects the increased mining, construction, farming, ranching, and merchant employment bases.

TABLE 21: EUREKA COUNTY POPULATION ESTIMATES.

Year	Estimated Population
1960	767
1970	948
1980	1198
1982	1250
1984	1350
1986	1530
1988	2007

Source: Nevada Department of Taxation, 1988.

As of 1980, over half of the county's population resided in the county seat of Eureka. The rest of the population primarily resides in the north end of the county in the towns of Crescent Valley and Beowawe. Table 22 forecasts a 100 percent increase in population in the County between the years 1990 and 2010. While this indicates an overall growth trend, it does not indicate short duration projects which could cause population surges in the county (primarily in the town of Eureka). Nearly any development would create major changes due to the low population base and its sensitivity to fluctuations (Elliott, Marcia, Eureka County Clerk and Treasurers Office, personal communication, 1989).

TABLE 22: EUREKA COUNTY POPULATION FORECAST

Year	Estimated Population
1990	1780
1995	1972
2000	2420
2005	2936
2010	3541

Source: Nevada Department of Taxation, 1987.

EMPLOYMENT

The employment in Eureka County centers mainly around mining, government, construction, and agriculture (Table 23). The extent to which Eureka County relies on mining is readily apparent and much greater than that found nationally. Table 24 represents the total work force and unemployment rate of Eureka County. Unemployment for the period of 1976-1983 ranged from 1.8 to 14.6 percent.

TABLE 23: NON-AGRICULTURAL EMPLOYMENT FOR EUREKA COUNTY IN 1988

Category	Employees	Percent of Total
Mining	2260*	73
Construction	660**	21
Government	110	4
Trade	40	1
TCPU	20	.5
Services	20	.5

* - Approximately 1900 of these employees live in Elko/Carlin. ** - Approximately 500 of these employees live in Elko/Carlin.

TABLE 24: EUREKA COUNTY LABOR FORCE AND UNEMPLOYMENT RATES

Year	Labor Force	Unemployment Rates (%)
1984	900*	5.7
1985	1180	5.9
1986	1230	4.1
1987	1500	2.6
1988	2900	1.8

* - Approximately 80% of the labor force lives in Carlin/Elko

HEALTH

The town of Eureka has a health clinic and a full-time resident doctor. The county also maintains an ambulance and a volunteer organization supplies licensed ambulance attendants. Table 25 shows health and medical expenses for the county in 1987-1988 (Rebeleati, M., Eureka County recorder and auditor, Personal comm. 1989).

TABLE 25: EUREKA COUNTY HEALTH AND MEDICAL EXPENSES 1987-1988

Category	Expense $
Rural	
Health Nurse	4,000
Home Health Care	3,500
Clinic	111,270
Ambulance	18,039
Indigent Medical	17,890
County	
Employee Insurance	120,000

Source: Eureka County Budget 1987-1988.

HOUSING

The rental housing market and conventional houses available for sale in the Eureka area are almost non-existent. Developed mobile home lots constitute the majority of housing in Eureka. At present, 120 new lots have been approved and are being constructed. These should be finished by the fall of 1989. The existing lots in Eureka are at approximately 50 percent of capacity. There are 5 hotels and motels in the area with a total of 80 rooms. Occupancy averages 100 percent in the summer months and 30-70 percent in the winter months.

WATER AND WASTE WATER

Depending on location, Eureka residents are dependent upon the county for sewage and water services. Sewage and fresh water capacity for the Eureka area were discussed with the Dept. of Public Works. The construction of new sewer mains and ponds in 1981 should provide ample capacity for any increases in population.

PUBLIC UTILITIES

The possibility of increased power usage from new housing units was discussed with Mt. Wheeler Power. Any reasonable increase in power use in the area surrounding downtown Eureka would be well within the capacity of the system. Downtown Eureka is on a much older system and could be impacted by increased power use. This isn't foreseen to be a problem as there is almost no space for new housing in this area (Lee, C., Mt., Wheeler Power, Personal comm., 1989).

LAW ENFORCEMENT

Law enforcement in Eureka is provided primarily by the county sheriff's department. The area also has one Nevada State Highway Patrolman in residence. The sheriff's department budget for 1989 is $443,000 as compared to the 1985 budget of $268,000. Staffing levels are sufficient to handle any reasonable increase although personnel turnover has been high (Jones, K., Eureka County Sheriff, personal comm., 1989). The high turnover rate is primarily associated with changes in administration. A new jail is in the process of being constructed and should be finished by the end of 1989.

EDUCATION

School services in Eureka are operated by the Eureka County School District. There are two schools in the town of Eureka: the elementary school (K-6), and the high school (7-12). Enrollment in the spring of 1989 totalled 238 pupils: 149 in grades K-6 and 89 in grades 7-12. According to Roy Casey (Superintendent of the Eureka County School District) the capacity of the high school is around 110 students. The capacity for the elementary school has already been exceeded. In the past few years, enrollment at the elementary level has increased greatly while enrollment at the high school level has seen no increase.

ELKO AND CARLIN

Mining activity in northeastern Nevada has increased significantly in recent years and is the primary contributor to growth in and around the communities of Elko and Carlin. In addition to revenue associated with the mining industry, Elko's tourism economy is also booming; the net results have been increased demand for housing and services. This demand is impacting not only the City of Elko, but county and state agencies as well.

Elko, located 20 miles east of Carlin along U.S. Interstate 80 and two major railroad lines, is the economic and social hub of northeastern Nevada. Official 1988 state figures show the populations of Elko County, the City of Elko, county seat, and the City of Carlin are 26,790, 14,620 and 1,850 respectively. However, many county and city officials believe that the actual populations are nearer to 30,000, 16,000 and 2,500 respectively. The official state population figures were contested by county and city officials, but were upheld.

Much of the growth over the past few years has been attributed to younger families moving to the area. Many of the new residents are employed by mines located in Eureka County, but live in the established communities of Elko, Carlin, and the surrounding area.

This situation is of great importance when considering that most of the mining capital improvements and net proceeds tax revenues benefit Eureka County while services must be provided to residents of Elko County without full benefit of the tax base.

BATTLE MOUNTAIN

The Battle Mountain area has a long history of mining activity related to a variety of minerals including copper, lead, barite, silver and gold. Battle Mountain has experienced the cyclic nature of the mining industry with the rapid development and subsequent abandonment of the barite industry in the late 1970s and early 1980s. Although the failure of the barite industry had a profound effect, the community was spared the full social and economic impact of a "boom-bust" situation by concurrent mining of other minerals. Paralleling trends in the mining industry, Lander County and the town of Battle Mountain have experienced fluctuating populations with an overall growth trend.

Battle Mountain, an unincorporated town, is the county seat of Lander County located approximately 60 miles west of Elko along U.S. Interstate 80. Official figures are not kept for unincorporated towns, however it is possible to make an estimate based on other available information. For example, 1970 and 1980 census figures show that 69.6% and 67.4% of Lander County's population resided in Battle Mountain respectively. Assuming intercensal figures are consistent with this percentage, and using official state estimates for Lander County population, the current population of Battle Mountain is estimated to be 3,400 (See Table 26).

TABLE 26 OFFICIAL POPULATION FIGURES FOR LANDER COUNTY, BATTLE MOUNTAIN POPULATION ESTIMATES, 1982 TO PRESENT.

	1980	1981	1982	1983	1984	1985	1986	1987	1988
Lander County*	4,076	4,980	4,970	4,700	4,570	4,500	4,490	4,580	4,96
Battle Mountain**	2,792	3,411	3,404	3,219	3,130	3,083	3,076	3,137	3,40

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* Official State Estimates, Nevada Statistical Abstract, 1988.
** Unofficial Estimated Population using 68.5% of Lander County Figures.

Although the County has an estimated population of 4,964, local officials are of the opinion the county's population is higher.

TRANSPORTATION

The main highway utilized by mining companies traveling from the east and west to the Eureka Mining District/Roberts Mountains Region is U.S. Highway 50 which runs through central Nevada. Access from northeast Nevada (Elko) is provided by State Route 278 and west to the J.D. Ranch Road to the Tonkin Road. State Route 278 joins U.S. Highway 50 approximately 18 miles west of Eureka.

Three Bars Road intersects Highway 50 about 20 miles west of the community of Eureka and provides direct access to many of the claims in the Roberts Mountains area. The Three Bars Road unites with the unimproved graveled Tonkin Road, just north of the Tonkin mine. The graveled Three Bars Road also provides access to many existing "two-track" unimproved dirt roads extending from Three Bars Road and leading to claim areas. Many of the existing "two-track" unimproved dirt roads in the Roberts Mountains area are also used by the grazing permittee and by the public for recreational use.

The Roberts Creek Road is a county road that branches off U.S. Highway 50 just east of Lone Mountain and south of the Roberts Mountains, and continues north through Roberts Creek to Vinini Creek. Roberts Creek Road provides access to claims located in the southeast portion of the Roberts Mountains area.

ASARCO:

ASARCO claims bordering the west side of the WSA are reached via Pete Hanson Creek Road which branches from the Tonkin Road. The area of current exploration activities located along the east side of the WSA boundary is accessed via the Willow Creek Ranch Road and south along Dry Creek Road. Southern claims are accessed via Roberts Creek Road.

ATLAS:

Access to the Gold Bar mine facilities is via U.S. Highway 50 approximately 26 miles then north of the 3 Bars Road another 17 miles to the mine. Roads used to access the Gold Bar II (Satellite project) are the Roberts Creek Road, Cabin Creek Road, and the Roberts Creek Access. An existing road that connects with Roberts Creek Road in Section 24, T.22N., R.50E., provides access to the Flat, North Flat, and Northwest Flat. Atlas intends use these roads during all seasons which may require surface blading, snow removal, and addition of gravel for surface maintenance. Atlas estimates that Three Bars Road is used 20% of the time and Roberts Creek Road 80% of the time.

GEXA:

Gexa claims located below the Hycroft claim are accessed via unimproved two-track dirt Red Canyon Road which branches from Tonkin Road. Gexa's other claim block located in T.23.5N., R.51E. is accessed via the two-track dirt Gabel Canyon Road which extends from the Willow Creek Ranch Road, an extension off of the Tonkin Road.

HYCROFT:

The Hycroft claim block is accessed via unimproved two-track dirt Red Canyon Road which branches from Tonkin Road.

NERCO:

Access to the Hunter, SiSi, and the leased Pegasus claims are via the Roberts Creek Road that extends from U.S. Highway 50. The southern portion of the Chev claims is accessed via an unimproved two-track road from the south that branches off the Roberts Creek Road at the Roberts Creek Ranch. This road traverses the upper portion of the Rutabaga Creek drainage through the Chev claims and has been continued off the project to the northeast by Atlas Minerals to access their claims.

The northern portion of the Chev claims and the remaining western claims are accessed via the Cottonwood Canyon Road which branches off the Three Bars Ranch Road to the west and via an unimproved two-track road that branches off the Cottonwood Canyon road and traverses the eastern range front between Cottonwood Canyon and Rutabaga Creek. If winter access is necessary, NERCO will improve the Cottonwood Canyon Road or Rutabaga Creek Road under a plan of operations.

PEGASUS:

The two southern Pegasus claims operated by Nerco are reached via the Roberts Creek Road. The northern claim near the WSA boundary is accessed by the Pete Hanson Creek unimproved dirt road that branches from the Tonkin road.

PHELPS-DODGE:

Access to the claim block is via Highway 50 to the Three Bars Road and east on the unimproved Cottonwood Canyon Road. Construction of the Cottonwood Canyon Road pre-dates Phelps-Dodge activities. If winter access is necessary, Phelps-Dodge will upgrade Cottonwood Canyon Road under a separate plan of operations which would include construction of bermed sides, waterbars, and culverts at drainage crossings.

SANTA FE:

Santa Fe claims are reached via the Roberts Creek Road which extends from U.S. Highway 50. The Westley claims operated by Santa Fe are reached by Roberts Creek Road and the Henderson Summit Road.

U.S. BORAX:

Access to U.S. Borax claims is via an unimproved two-track drill road paralleling Frazier Creek and branching from State Route 278 which joins U.S. Highway 50 approximately 18 miles west of Eureka.

U.S. GOLD/SILVER STATE:

The claims and mines operated by U.S. Gold/Silver State are accessed mainly from Highway 278 from the north to the J.D. turnoff and along Tonkin Road. The Three Bars Road is traveled from the south. Access to the North Tonkin project is through an existing haul road in Section 33 T.24N., R.49E extending from Tonkin Road. Numerous drill roads extend from the Tonkin Road and provide access to the mine sites.

POWERLINE DISTRIBUTION

The powerlines in the area are 3.5 megawatt lines and are required by the BLM to have raptor protectors. At this time there is a line running from Diamond Valley across Kobeh Valley to the Atlas Gold Bar I Mine. Tonkin Mine will be getting new power from a line going south from Cortez via Cortez Canyon and McCluskey Pass.

CULTURAL RESOURCES

A Class I file search and cultural resource overview has been completed for the Roberts Mountains Region. The site listings are divided into impacted, future impacts, no impacts, possible impact and unknown location groups. The ways that cultural impacts may accumulate are discussed. Application of the Atlas Precious Metals Inc./Bureau of Land Management Memorandum of Agreement to the entire region is recommended. Applications of the MOA will help insure compliance with the Federal 106 Review Process. The BLM is urged to consider secondary impacts by gathering quantifiable data on offsite cultural resources for future reference. The purpose of this section is to assess the past and potential impacts to known cultural resources within the area covered by the CAR. This contribution is not based upon field truthing but is only an analysis of existing data on file at the Battle Mountain office of the BLM.

Tables 1-5 (Appendix B) summarize the past and potential impacts that may occur to known cultural resource sites within the study area. Those sites marked with a single asterisk (*) are those that may have been given an improper legal location description as discussed above (See Overview Methods). Those sites marked with a double asterisk (**) are of uncertain location but based on the project location, may be just north of the study area. The tables were developed by comparing the U.S.G.S. plotted locations in the various reports and file maps with the map supplied NCG plotting past and proposed impacts.

Table 1 represents sites that appear to be well away from direct impact. Some of the sites are close to proposed impacts, but may in fact not be impacted (Table 2). Table 3 lists sites that appear to be within the boundary of a future mining development. Table 4 is a list of sites that appear to have been impacted or possibly totally removed by past projects. Table 5 is a list of sites whose location is not certain, hence, the status of the site is not known. The tables represent only sites and artifacts that have been reported as of September 15, 1989.

Not all of the study area has been inventoried and the probability of additional significant resources being within the study area is high.

OVERVIEW METHODS

The cultural resource consultants carefully examined the cultural resource data files at the Battle Mountain BLM with assistance from Mr. Gary Fauwks, Area BLM archaeologist. The file search called for a listing of all known cultural resource inventory reports, examination of cultural resource inventory site forms and comparison of report maps with BLM file maps and inventory listings. The consultants copied numerous cultural resource reports at the BLM and requested copies of larger reports or reports that were not available in the BLM files from various cultural resource consultants.

In addition to the Battle Mountain BLM, the Nevada State Office BLM and Nevada State Historic Preservation Office (SHPO) were contacted. A few documents were obtained from these offices, the most important of which is the draft Memorandum of Agreement being considered between BLM and Atlas Minerals. This document will be referred to in a latter section of this report. A descriptive list of impact definitions were obtained from Great Basin Research for this report.

Finally, the reports and publications of a general interest, valuable for setting the cultural resources of the research area into perspective, were obtained from sources other than the BLM. Notable among these were the Office of Public Archaeology at Brigham Young University, the Brigham Young University and University of Utah central libraries, the Utah and Nevada SHPO and the reference collection at NCG.

The file and library research had two primary goals. First was to establish a history of past research and a cultural overview of the research area. The result is a fairly generalized overview that will help place the known cultural resource into perspective. Second, the search resulted in the cataloging of a large number of historic and prehistoric sites within the research area. Specifically, this information was to be used to assess past impacts to recorded cultural resource sites and to determine what, if any, impacts will occur as the mining activities in the area expand.

As noted in the Introduction, this research was not a field-truthing, and its accuracy relies completely on three critical factors; 1) the reliability (completeness) of the BLM file system; 2) the location accuracy of the cultural resource sites as described in the reports and as plotted on the U.S.G.S. maps; and 3) the accuracy proposed future impacts from mining activity as plotted on the maps provided to NCG.

As to the completeness of the files, the BLM has expended considerable efforts over the past few years to update and correct file deficiencies. It was the opinion of both the State BLM and SHPO that the files at Battle Mountain would be the best available. It has not been the practice in Nevada, as in other states, to consistently supply the State BLM or SHPO offices with copies of reports from the various federal agency districts. With only a few minor exceptions, NCG found copies of the required reports in the BLM files at Battle Mountain. Deficiencies were corrected by obtaining the missing reports directly from the cultural resource consultants who produced them or in one case, from the corporation that the reports were completed for.

Areas were considered in relation to two baseline maps of future (proposed) impacts provided by Great Basin Resource Management. These maps show, as best a 7.5 or 15 minute Series topographic map can, the areas already impacted and the proposed expansions. It is assumed that the maps are relatively accurate.

In general, the reports are of a adequate level, representing a good faith effort on part of the various consultants. However, it was noted that several cultural resource sites legal location were improperly described in relationship to the USGS cadastral survey. The plot locations were on maps lacking the cadastral grid system and the individual attempting to plot locate the sites used a grid that appears to have been about 1/2 a section off.

It is assumed that the map plottings themselves are accurate, having no field checks to confirm the locations. The plottings were made on both USGS 15 and 7.5 Minute Series maps, and an exact plotting in relationship to a past or proposed impact is not always possible. This is could be a critical problem as the distance of a few feet on the ground can make the difference between preservation and impact, and knowing in advance with certainty that one or the other will occur.

RESOURCE OVERVIEW

The file search resulted in the review of several excellent overviews of the regions history and previous research. In order to understand a little more clearly the background of the cultural resources, a brief overview of the prehistory and history is presented below. A chronological table (Table 31) is provided as a convenient summary of the regional history.

PREHISTORY

The Great Basin has been a location of human occupation since at least the 9th Millennia B.C. (Aikens 1978:141; Jennings 1974). There is little question that Central Nevada, which includes the Roberts Mountain area, played a contributing part in the human history of the Great Basin (James 1981; Thomas 1982; and James and Elston 1984). The prehistory and history of the research area breaks down into four general periods of occupation: Pre-Archaic (Paleo-Indian and Western Pluvial Lakes Tradition), Archaic, Numic and Historic.

PRE-ARCHAIC

The study area was occupied during the Pre-Archaic by two groups, the Paleo-Indian and the Western Pluvial Lake Tradition. Dating from about 9000 B.C. - 6000 B.C. (Table 31), these two traditions are characterized by the presence of distinctive fluted points such as the Clovis (Paleo-Indian) and a point apparently unique to the region for the time-the Great Basin Stemmed (Western Pluvial Lakes Tradition).

It is assumed by nearly every contributor to the field that these two traditions based their life way on big game hunting, with specialized marsh/lake side (lacustrine) adaptations where the environment allowed. In truth, we know very little about the subsistence cycle of these early groups. Pre-Archaic sites in the region are surface scatters that have little if any stratification or clearly associated features. Inferences about subsistence systems are derived from kill sites located beyond the study area and are usually found on old beaches or in old marsh environments. Stratified cave sites or open camps sites that may contain evidences of a more diversified subsistence are unknown in the research area. Only a small handful of surface scatters that appear devoid of features or stratification are known to exist in the study area and have yet to be intensively examined.

ARCHAIC

As the Great Basin environment changed, so did the subsistence pattern of those descended from or who replaced th Pre-Archaic people. By about 6000 B.C., most of the smaller pluvial lakes were gone as were the remnants of large Pleistoc fauna. For the next 7000+ years (Table 27), the Great Basin w inhabited by groups collectively called the Archaic. This lon time period has been subdivided into various Phases, each with its unique bench mark artifacts or settlement pattern.

TABLE 27: CHRONOLOGICAL SEQUENCE-ROBERTS MT. AND CENTRAL GREA BASIN (after Thomas 1983; James and Elston 1984)

TIME INTERVAL	CULTURAL STAGE OR ADAPTATION	CHRONOLOGICAL PHASE	CHARACTERISTICS
AD 1850-1930	Historic Proto-historic		Historic debris
AD 1300-1850	Numic	Yankee Blade	Rose Spring, Cottonwood seri
AD 500-1300		Underdown	Rose Spring, Eastgate series
1000 BC-AD 500	Archaic	Reveille	Elko series
3000-1000 BC		Devils Gate	Pinto, Humboldt Concave base, Gatecliff series
6000 BC-3000 BC		Clipper Gap	Northern Side-Notched, stemme and concave base
9000 BC-6000 BC	Pre-Archaic Stemmed Western Pluvial		Great Basin large leaf-shap and concave base
	Paleo-Indian		Fluted Points

It is probable that the life cycle consisted of seasonal rounds, migrating from one food source to another. Evidence f anthropologists know more of their lifeway than any prior period. This is largely attributable to the work of Julian Steward during the late 1920s' and early 1930s'. Steward expended great effort in collecting ethnographic information on subsistence and settlement among other topics and published the work in 1938 (Steward 1938). The models developed by Steward describing seasonal movement and resource exploitation are applied to the pre-contact Numic and form the basis of most models concerning the Archaic lifeway in the Great Basin as well (Thomas 1982).

One of the more interesting aspects of Stewards' works was the identification of several Shoshonean encampments. Two such encampments were located in the Sulphur Springs Mountains and one, referred to as "Bauwiyoi", was located at or very near the Warm Springs Ranch on the northern end of Roberts Mountain. From this camp, the occupants were apparently exploiting a nearby slough. The area was also known for the availability of a variety of seeds, roots and pine nuts, and the western face of the mountain was also well known as a source of pine nuts (Steward 1938:141).

HISTORIC

TRAPPERS AND EXPLORERS

The first non-Native Americans to enter northern Nevada were fur trappers associated with the Hudson Bay Company and the Rocky Mountain Fur Company (Elliot 1987). In the spring of 1826, Peter Skene Ogden, of the Hudson Bay Company, entered northeastern Nevada but made only a slight intrusion. While Ogden may have been the first Anglo-American to enter Nevada, it was Jedediah Smith of the Rocky Mountain Fur Company who first traversed the State in the same year. Ogden returned to Nevada in 1828 when he entered from the north near present day Denio (Elliot 1987). He and his party moved south to the Humboldt River where they continued to trap until 1830. Other trappers such as William Wolfskill, Ewing Young and Antonio Armijo, operating out of Santa Fe, continued to trap in Nevada through the 1830s.

The mountain men were soon replaced by emigrants and government explorers. During the 1840s, parties of emigrants became the first to cross northern Nevada. In 1841, the Bartleson-Bidwell party entered the state from the direction of the Great Salt Lake, crossed the salt flats west of the lake and followed the Humboldt drainage to the Sierra Mountains (Bancroft 1890; Fletcher 1929; Elliot 1987). Many pioneers and forty-niners continued to use this route which became known as the Humboldt Trail. This trail had much to offer the travelers of that period including water, grass for animals, and a more direct route to California. One emigrant group that did not fair so well on the trail was the ill-fated Donner Party. The story of this event has been well documented and need not be recounted here. Suffice it to say that the Donner Party was held up in their crossing of the Wasatch Front and was late in arriving at the Sierra Mountains where the members of the group were caught in snow. Many of the party died from the exposure to the cold (Elliot 1987).

The government explorers soon followed the first emigrants. The most famous of these was John C. Fremont. Fremont was a Topographical Engineer for the US Army and was commissioned to explore and map the west. It was Fremont who named the Great Basin after noting its large bowl-shaped topography. On his expedition of 1843-44, he and his party traveled down the western side of Nevada and later returned through the southern portion of the state. In 1845, Fremont again returned to Nevada. This time he came directly west from the area of the Great Salt Lake. At Mound Springs, Fremont split his party into two groups. The first group under Theodore Talbot moved northwest where they encountered the Humboldt River. The second group under Fremont continued southwest through southern Eureka and Lander Counties. Both groups re-united at Walker Lake and continued south into California (Bancroft 1890; Fletcher 1929; Elliot 1987).

In 1858,the Army established a military post, Camp Floyd, in Cedar Valley, Utah. The following year, Captain J. H. Simpson of the Army Topographical Engineers set out to establish wagon routes from Salt Lake City to California. His route entered near Ely and continued west through central Nevada. Simpson's trail passed near the present day communities of Eureka, Austin, Fallon and Carson City, as well as the project area. Simpson's route brought him and his men crossed over the Sulphur Spring Range into the area of Mt. Hope (Zier 1985). Simpson camped at the site of the Roberts Creek Ranch which later would become both a Pony Express and stage station (Price 1988).

TRANSPORTATION AND COMMUNICATION

Prior to Simpson's trip through Nevada in 1859, Woodard and

Chorpenning of Sacramento began operation of a mail service in 1851 (Bancroft 1890). The mail was carried by mule and became known as the "Jackass Mail" (Zier 1985:15). As the mail service increased, Chorpenning and his new partner Bill Holladay began to carry passengers. Chorpenning changed the route in 1858 to pass through the northern end of Diamond Valley and Pine Valley after which the route rejoined the Humboldt trail. By 1859, Chorpenning again moved the line to follow Simpson's new route and began construction on stage stations, approximately 13 miles apart (Zier 1985). The stations were not all completed before the Pony Express took over the mail contract and the stations.

Russell, Majors and Waddell were the owners of the Pony Express Company and they choose the central route through Nevada as the quickest and shortest trail for their riders. Although the Pony Express did not last long (only 18 months), it did assist in further establishing a new trail and stations for the Butterfield Overland Mail and Stage Company. The Roberts Mountains received their name from Bolivar Roberts, a Division Superintendent for the company. Prior to this time the Butterfield Stage Line had operated along the northern Humboldt route but moved south after the demise of the Pony Express Company in 1861 (Zier 1985).

After 1869, the Butterfield Overland Mail and Stage Company was forced to abandon the route when the Central Pacific Railroad chose the Humboldt River as its course over northern Nevada. The stage companies assumed the role of connecting the railroads and the widespread communities. Several of these lines passed through or near the study area which included the Palmer, Palmer and Russell Stage Line (1869), White Pine Stage Line (1870), and the Palisade Fast Freight Line (1871)(Zier 1985).

It was not long before the stage lines were replaced in the mining districts by the railways. In October 1875, a narrow-gauge railroad, the Eureka and Palisade Railroad, was completed to Eureka (Bancroft 1890; Molinelli 1879; Zier 1985). The same year a telegraph line was also completed from Palisade and Eureka following the railroad corridor.

MINING

The history and development of the project area is directly related to the discovery and mining of silver in the region. Silver was first found in the area in the summer of 1864 about a mile south of Eureka (Molinelli 1879). However, it was not until

1869 that mining in the region began to take root and flourish. The detailed history of the area can be found in Angel (1881), Bancroft(1890), Elliot (1987) and Molinelli (1879).

CHARCOAL

While the main industry in the project area was mining, a secondary related industry was the production of charcoal. This material was required for the reduction of the silver ore. In 1879, Eureka had sixteen furnaces that could process "forty to sixty tons" of ore a day (Molinelli 1879:25). How much charcoal these furnaces required to process the ore is unknown. The demand to keep the furnaces running and the possible deforestation problem was visible as early as 1879, as illustrated by Molinelli when he wrote:

> It is impossible to obtain correct statistics of the charcoal manufacture of Eureka. Its production has so far kept pace with the requirements of smelting that there has been no material change in the price for over four years. The supply, however, is limited, and before long our smelters will look to the illimitable forests of the Rocky Mountains and the Sierras for their coal (1879:25).

Zier stated in 1985 that an "estimated ... 1.25 million bushels of charcoal were consumed in Eureka smelters."

The method of producing charcoal required the construction of temporary ovens that were oval-to-circular in shape. The pinyon was stacked 5 meters high and 12-25 meters in diameter (Zier 1985). Beehive shaped ovens were required for the woods like juniper and mountain mahogany which burns at higher temperatures. The charcoal making process was discussed in part by Molinelli as follows:

> The fuel used in smelting is charcoal of most excellent quality, weighing over 17-1/2 lbs. to the bushel. It is burned from nut pine (Pinus Monophylla), within a radius of forty miles of Eureka. The price per bushel for the past five years has averaged about 28 cents (1879:30-31).

The production of charcoal was stopped when the US Department of the Interior halted "the clear cutting of the pinyon-juniper woodlands in 1887 (Zier 1985:18). However, some charcoal burning continued until 1891 (King and Price 1988).

ETHNIC BACKGROUND

The production of charcoal in the study area has been identified with Italian immigrants, who referred to themselves as "Carbonari." These people have been more specifically identified as having come from northern Italy and southern Switzerland (Zier 1985). The Carbonari are responsible for most of the charcoal production sites found throughout the study area. "By 1870 Nevada had the largest proportion of immigrants in its population than any other state" (Elliot, 1987). However, concerning the Cortez Mining District Hardesty and Hattori have found that there is a "functional variation" as well as an "ethnic affiliation" in design:

> ...functional variation among the sites is manifested in the contrast between pits and the kiln. Kilns are usually associated with structures and are close to major transportation routes, whereas pits tend to be away from major transportation routes and do not seem to be associated with structures. Also, pits tend to be a one-time occurrence, while kilns are used over a long period of time. The ethnic affiliations of the charcoal makers are reflected in the design of the pit; i.e., British pits were usually round, Swedish pits were square or rectangular. Pits that are oval in shape are usually associated with Chinese; however, it is thought that this style was adopted by the Chinese from the British (McCabe 1988:28).

The charcoal burners were kept at a low standard of living which was evidenced in the Charcoal Burners War of 1879. In the Eureka area the mine superintendents revolted at paying 30 cents a bushel for the required charcoal and set the price at 27 cents (Elliot 1987; Bancroft 1890). The striking Italians made threats against the mine managers and Governor Kinkead was forced to call out the state militia. A few days later, on August 18th, Deputy Sheriff J. B. Simpson tried to arrest several of the striking charcoal burners at Fish Creek. Five persons died and six were wounded while resisting arrest. Eventually, the charcoal burners lost and the price per bushel was reduced to 22 cents (Bancroft 1890; Elliot 1987).

SUMMARY

The research area contains a wide variety of sites from both the historic and prehistoric area periods. The vast majority of the prehistoric sites (Tables 2 and 3) are lithic scatters of undetermined cultural affiliation and limited data potential. A few campsites or lithic scatters can be placed within a cultural framework and need to be protected or mitigated if impacted. Some of the sites are historic remains, several of which are carbonari locations and potentially eligible for the National Register.

RECREATION

The topography and climate of the Roberts Mountains and Eureka County are conducive to a diverse range of recreational activities. Hunting, fishing, and day use are the primary recreational activities in the Roberts Mountains region. Primary recreational users would include deer and sage grouse hunters, fishermen, campers, picnickers, hikers, backpackers, ORV use (dirt bikes, ATV, four-wheel drive) and rock collectors. Additional activities in the Roberts Mountains region include woodcutting, post/pole cutting, collecting pine nuts, gold panning, and non-consumptive use of wildlife. Activities confined to the winter season include trapping, snowmobiling, snowshoeing and cross-country skiing.

The majority of hunting is for mule deer and sage grouse. Other game species hunted in limited quantity are cottontail and pigmy rabbits, chukar, mourning doves, Wilson snipe, waterfowl, and blue grouse. Fishing is limited to Roberts Creek, Vinini Creek, and Tonkin Spring which have suitable habitat to support rainbow, brown, and brook trout. There are no developed campgrounds or day use areas in the Roberts Mountains. The majority of camping and picnicking occurs in the vicinity of Roberts Creek. Hickison Summit, located southwest of Roberts Mountains is the nearest developed recreation site.

CHAPTER IV MITIGATION

VEGETATION

Most of the vegetation impacts can be mitigated by revegetation with adapted species. Where long-lived slow growing woody species such as pinyon, juniper and mahogany were dominant, re-establishment can take up to 100 years. The time period can be shortened at considerable expense using container grown trees.

OTHER MINERAL DEVELOPMENT

Oil and gas leases exist within the region. The number and extent of these activities is not presented as a part of this cumulative report, however, these activities are now a reality in the region and will add to the overall mining and mining related activities in the region. Mitigation will require reclamation of roads, drill pads and other disturbances. Mitigation will be required as other resources are impacted, e.g., water, wildlife, air quality, etc.

SOILS

The soils of the region are generally not highly eroded except where disturbed. Where the natural vegetation is disturbed the potential for accelerated erosion may be increased. Mitigation will require vegetation reclamation of disturbed sites and measures to control gully erosion.

PALEONTOLOGY

There should be an effort to minimize destruction of stratigraphic records. Significantly important areas of fossilization should remain undisturbed.

RANGE MANAGEMENT

Two general types of mitigations should be considered, including: major mitigations to offset the present loss of AUM's of grazing; and, more minor mitigations to prevent the present situation from becoming more difficult as well as preventing potential future increased activity resulting in additional livestock or AUM loss.

MAJOR: Three general approaches were considered in offsetting the current loss of suitable habitat for 200 cows. They are:

1. Ranch purchase: A neighbor ranch (Baumann Ranch) is available for purchase that would offset the loss of the Tonkin Springs area. The Baumann Ranch headquarters is located on McClusky creek about 25 miles from the J.D. Ranch headquarters. The Baumann summer range lies immediately to the west of the J.D. Ranch summer range, and is of similar quality to that at Tonkin Springs. Purchase of this unit would more than offset current losses, assuming that future mining activity did not include the Baumann Ranch. However headquarter accessibility to the J.D. Ranch is not particularly good, especially during winter months.

2. Seeding: Suitable sites for reseeding with crested wheat exist away from the immediate Tonkin Springs area to offset present losses. A seeding providing 800 AUMs (200 cows for 4 months) would appear to mitigate the present loss. Assuming 4 acres per AUM a seeding of this magnitude would require 3,200 acres (5 sections). A seeding would also require additional fencing, and in all likely hood water development.

3. Increased or new management: Existing forage within the J.D. Ranch allotment could be better utilized, however this would require development of new water sources to encourage grazing away from the Tonkin Springs area as well as fencing. In order to fully offset current losses in grazing, it would seem that a rather extensive grazing management plan would be required. Additionally it is questionable if sufficient quality forage would exist under any management plan to fully offset the loss of quality forage within the Tonkin Springs area without additional forage manipulation, including seeding.

Of the above three alternatives, the only feasible financial approach would be the development of additional forage through seeding coupled with fencing and water development as required. Continued increases in mining activity may result in the requirement to purchase additional ranching properties, if continued livestock grazing at the present level is a prerequisite.

MINOR: Several minor mitigations were considered that would minimize current and future impacts. They include:

1. Reclamation: A current reclamation plan needs to be implemented. General activity is such that the area, long considered a good bunch grass range, is being rapidly opened up

to invasion by undesirable annuals including cheat grass. Exploration sites should be reclaimed on an annual basis. Roads should be kept to a minimum, including recontouring to original slope and revegetation immediately after activity has terminated. Revegetation should include appropriate wheatgrass and adaptable forbs. Lack of reclamation plan on exploration sites should not be based upon potential future mining activity.

2. Roads: Existing and new permanent roads need to be constructed in a fashion to facilitate the increased vehicle occurrence as well as increased load capacity. Roads must be designed to minimize runoff impact on soil resources. Adequate cattle guards must be installed, and existing cattle guards need to be maintained and cleaned out on schedule to continue to be effective.

3. Personnel management: The increased use of the surrounding federal lands by mine personnel during off hours needs to be monitored, with existing regulations enforced, including prohibiting camping in the vicinity of livestock water sources. The mine needs to institute educational programs for personnel on the importance of protecting the many renewable resources that exist on federal lands. A better level of communication needs to be implemented between users and regulatory units, including the permittee, the mine, the BLM and county units including the road department and sheriff's department.

Implementation of these concurrent on site mitigation measures would minimize future impacts to livestock grazing, as well as greatly reduce damage to surrounding renewable natural resources. It is important to note that at this time no mitigation measures are in effect other than what efforts the mine puts forward as a "good neighbor".

Several alternatives must be considered for mitigating potential impacts on the grazing allotments and the Eureka Livestock Company. Potential mitigations are set forth below:

1. No action - this alternative potentially could result in loss of the grazing operation for two bands of sheep and to overgrazing of the riparian zones along several creeks in the region and other sites by cattle. Neither of these scenarios is acceptable.

2. Move the sheep across the haul road by driving during a time when trucks would be restricted to allow passage and move the band to areas adjacent to the new mine area to provide grazing for a restricted number of ewes and lambs thus saving at least part of the two bands.

3. Intensive Grazing Management. To better use the forage resource in view of the new and continuing mine activities, a detailed grazing management system or systems could be initiated requiring additional resources for planning and management (It is recognized that intensive grazing management has been proposed in the past with mixed success). Such a plan would require additional range management on the part of the BLM and the users, along with greater expenditures for fencing, development of sources of water, trucking animals around and increased riding and herding. This alternative, while technically feasible, would probably not be economically feasible.

4. Turn out a smaller number of cattle so that part of the Robert's Creek Ranch herd could be maintained. This, however, would require a high level of riding and herding to prevent the herd from doing excess damage to riparian sites along Roberts Creek. Management costs would escalate.

5. Off-site mitigation. It may be worthwhile to look into the possibility of providing one or more off-site mitigations. Cash settlements and the provision of a powerline to the Roberts Creek Ranch have been suggested. Other off-site mitigations may be worth evaluating.

WILD HORSES

The potential for increased numbers of horses in Unit B (total removal area) may require mitigation. This mitigation would require population inventory and removal of animals every few years to maintain the zero population level prescribed by the BLM for the area. The temporary nature of the project would likely require only one or two removals by the BLM during the life of the project. Subsequent or residual effects after the mining activity would have to be assessed in the future.

WILDLIFE

The habitat loss for mule deer by mining and exploration activities can be mitigated through interim and final reclamation. The disturbed areas should be seeded with a browse/forb mixture to rejuvenate winter and summer range. Roads should also be closed (with a barrier), recontoured and seeded with a browse/forb mixture to decrease access and increase habitat. Further study of mule deer populations and summer range use may be necessary. Excessive deer hunting kill in the area may call for a need of separate unit management by NDOW. Quality of summer range in undisturbed areas should be increased to handle displaced deer. Grazing practices may need to be changed to improve condition, trend, and forage diversity in this range. Selective tree thinning may be necessary to open more areas for deer habitat.

Soil and rock erosion from the Gold Bar mine and dump sites into Roberts Creek should also be mitigated. This could be done through construction of a berm around the sites to prevent waste material from entering the lower drainages. There are several candidate areas along Roberts Creek which would provide excellent pool areas for fish. Pete Hanson Creek should be monitored for protection of the Lahontan cutthroat.

The impact of the proposed Atlas haul road on mule deer and sage grouse can be mitigated by sloping the sides in a way to allow easy passage for the animals. Steep slopes may act as a deterrent to migrating animals and could impact their survival by changing migration patterns. Heap leach pad construction will be regulated by NDOW as a permitting agency. This will insure that wildlife loss will be kept at a minimum. Aspen, riparian areas, and cliff sites will need protection for raptor nesting sites. All powerlines constructed should have mandatory raptor protectors. Sage grouse brood rearing may need to be improved in other areas to support displaced broods.

The Roberts Mountain HMP management objectives for wildlife may be subject to change based upon this report.

THREATENED AND ENDANGERED SPECIES

Threatened and endangered species should be monitored very closely. Establishment of new populations should be encouraged with existing technology and access to critical habitat areas should be minimized.

FORESTRY

Reclamation procedures should be followed that will restore trees where they are destroyed (see Appendix 1). Cordwood, pinenuts and other wood products should be harvested from impacted sites where practical.

WILDERNESS

Presently grazing and wildlife are the principle management uses within the WSA. No mining activity is presently allowed in the WSA unless it does not require reclamation. Mitigation includes judicious, managed grazing and reduced access.

RIPARIAN

Exploration roads near riparian areas should be reclaimed to enhance riparian areas. Removal of water should be monitored to prevent drying of riparian and meadow areas. Surface water and ground water systems should be further studied to determine the effects of lowering of these systems on riparian as well as fisheries, wildlife, and livestock.

Atlas has proposed to assist the BLM in enhancement of the aquatic and riparian habitat on Roberts Creek. Atlas proposes to provide equipment and manpower for the excavation of a pool in the creek for enhancement of aquatic habitat at some acceptable location on the creek. Adequate restriction from livestock would also improve the riparian habitat.

AIR RESOURCES

VISUAL RESOURCES

In order to mitigate visual impacts, the BLM has proposed a sample list of design techniques which can be implemented by the mining company (see Appendix). Examples would be to reduce the size of cut and fill slopes through changing road widths and grades; reducing earthwork contrasts through adding mulch, hydromulch or topsoil, and grass seeding of cuts and fills. Vegetation mitigation measures would consider the reduction of surface disturbance to retain existing vegetation, and using native plant species to enhance revegetation.

WATER RESOURCES

Surface Water Resources The proposed sediment controls would effectively control the off-site transportation of sediment for Atlas' proposed operations. Exploration activities could be required to include similar sediment control.

Stringent design requirements to reduce sediment loads should be followed where new mining development is close to perennial streams.

Groundwater Resources

In the event operators of Roberts Creek Ranch, or other nearby well owners, are impacted by a documented drawdown in their well as a result of Atlas' withdrawal, Atlas would work with them to remedy the situation by lowering the well pump, or providing water from Atlas's well, etc. U.S. Gold could make the same commitment to nearby users in Denay Valley.

Stringent design requirements should be followed where new mining development is close to perennial streams or other areas where the water table is close to the ground surface.

SOCIOECONOMICS

EUREKA

Fresh water capacity will be increased by the addition of a well that is under construction at this time. The estimated date of completion is in 1991 (Naillon, E., Eureka Dept. of Public Works, Personal comm., 1989).

The impact on Eureka schools should be a positive one. The increased revenues from the proposed project of $410,740 over a ten year span would amount to over $4 million dollars of revenue. This would more than cover the projected additional school district costs of $600,000 leaving a valuable asset when the mine is gone.

A $400,000 to $450,000 classroom expansion project is being planned for the summer of 1989. There are also plans for hiring two new teachers for 1990 at a cost of approximately $85,000/teacher (Salary, benefits and housing).

Relative to housing mitigation the impact on proposed project employees could be high due to the expense of buying or renting a trailer and lot. This could require mitigation by some form of alternative housing.

Overall, impacts to Eureka will be lessened by the revenues generated by the project. Prepayment of taxes is one option that could be considered. When the mining operation ceases, and no other activity occurs, Eureka County will be faced with the operating cost of expanded community services with lower population.

PLANNING

Many community organizations and departments would benefit from advance plans to accommodate the influx of mining employees and their families. Community meetings or workshops would inform community leaders of what to expect and also alert mining companies to community concerns and positions that many impact the project. Providing technical and planning assistance to local government agencies, businesses, and organizations represents one form of mitigation.

Community leaders should make a cooperative effort to assess the resources available to meet demands of mining related impacts to the community. Mining companies could then be approached for assistance in an organized manner with a prioritized list of needs. This would enable the most efficient use of resources and maximize the mitigation of impacts.

Efforts should be made to "follow through" on any contributions made. For example, a contribution made toward hiring a new staff member one year could place a burden on the budget of the department the following year in attempting to meet salary and administrative costs associated with the new employee.

HOUSING

Many of the communities in the affected area have limited hotel and motel rooms and camping or RV facilities. Such accommodations are attractive to mine and construction workers on short-term jobs. Such use of temporary accommodations can be detrimental to the summer tourist trade. Therefore assistance in finding housing for employees, or use of mancamps for short-term construction crews should be considered.

Related to the housing issue is staffing of law enforcement, school, and medical facilities. Unavailability of housing is a deterrent to prospective employees. To help with this situation mining companies that have company owned or operated housing may make units available for use by new law enforcement, teaching, or medical personnel necessitated by the influx of employees and their families to the community.

EDUCATION

School Districts in the affected area have grown as a result of increased mining operations in the area. In some cases growth in certain grade levels, particularly the elementary grades, has resulted in the need to hire more staff, and expand facilities.

Often the impact is felt before funds become available to meet demands of a larger student population. Such a circumstance may be mitigated through prepayment of a portion of the project taxes, or subsiding the purchase of mobile classrooms for the affected school.

HEALTH CARE

While the mines maintain emergency medical services, a serious injury or the presence of multiple victims quickly overtaxes their capabilities. Mining companies in the area should explore with local officials and health care providers the potential for upgrading emergency services such as providing advanced EMT training classes for the volunteer ambulance corp and encouraging participation of employees. This is of particular importance in rural communities that have limited health care staff and facilities.

EMPLOYMENT

Efforts should be made to hire employees and purchase supplies locally when possible. Informing local businesses of needs would allow them to compete with out-of-state suppliers. Careful scheduling of a project also helps to moderate the size of the work force, avoiding sharp peaks and valleys associated with various phases of a project, e.g. construction.

TRANSPORTATION

Use should be confined to existing roads as much as possible. Car pooling should be encouraged to reduce pollution and conserve energy. Roads should be constructed to minimize land disturbance.

POWERLINE DISTRIBUTION

The existing (one) and planned powerlines for the region will require mitigation in the form of reclamation of areas disturbed during construction, the placement of raptor protectors on all power poles, and possibly the placement of new lines to avoid important wildlife habitats or valuable cultural resource sites.

CULTURAL RESOURCES

It is easily recognized that significant cultural resources have been reported in the study area and that more probably exist in areas that remain to be inventoried. Insuring that various federally permitted projects are in compliance with federal law and regulation is a straight forward process which is generally referred to as the Section 106 Review. The process implements Section 106 of the National Historic Preservation Act (16 U.S.C. 470f) and the steps needed to complete the process are found in 36 CFR 800. While the process has a clear track when properly implemented, planning needs to be sufficient to allow time for the process to flow smoothly, otherwise, conflicts can occur.

The planning process for the study area can be simplified by the application of an existing Memorandum of Agreement (MOA), recently signed between Atlas Precious Metals Inc., and the Shoshone-Eureka Resource Area Bureau of land Management. The process is outlined in the GENERAL SCHEDULE OF EVENTS section as follows (1989:1-2):

Minerals exploration and extraction activities are likely to be conducted by Atlas Precious Metals Inc (Atlas or Operator), under plans of operation that will be multi-year in scope. Project areas generally will encompass a number of complex historic resources, not all f which need to be dealt with immediately upon Project initiation. A general schedule f events is outlined, based on the phasing of projects into a sequential series of one year planning periods. Actions during each planning year include the following:

> The operator (Atlas) defines specific activities to be conducted in the planning year and the area(s) in which these activities will be carried out.
>
> The BLM review present documentation on the activity area(s) and determines if historic resource inventories have been conducted.
>
> if an activity area(s) has not been inventoried, the operator (Atlas) conducts an inventory and reports the results to BLM.
>
> The BLM, in consultation with the SHPO,

reviews the inventory data for the activity area(s) and determines if it contains historic resources considered eligible for the National Register of Historic Places (NRHP). If historic properties in an activity area(s) are not considered eligible for the NRHP, the Operator (Atlas) will be allowed to proceed in that activity area(s).

If historic resources are present in the activity area(s), and their eligibility cannot be determined from inventory data, the BLM will require that a Testing Plan be prepared and implemented by the Operator (Atlas), and a report determining eligibility prepared and implemented by the Operator (Atlas), and a report determining eligibility prepared. Eligibility determinations presented in the report will be reviewed by the BLM, in consultation with the SHPO.

If eligible historic properties are present in the activity area(s), the BLM will require that a plan be prepared to guide mitigation of the project related effects. Once the plan has been approved by BLM and the SHPO, and the ACHE has been given an opportunity to comment, the plan will be implemented by the Operator (Atlas). A report will be submitted to the BLM.

Once all in-field mitigative actions have been completed in an activity area(s) and a preliminary report prepared, the BLM may authorize the Operator (Atlas) to proceed in that activity area-(a).

The MOA also contains stipulations that regulate the MOA, addressing specifics such as identification of historic properties, determination of treatment needs, development of treatment plans, reporting standards, and the implementation of the agreement.

The MOA has all the requisites needed to help protect or mitigate impacts to cultural resources. If there is a concern about the extend of the MOA, that concern lies in its actions being limited only to direct impacts at given sites. There is no clear consideration of Slow Degradation or Offsite (secondary) impacts that can occur when a major project occurs.

This problem is complicated by the fact that inventory of a specific project area(s) may not extend far enough beyond the boundary of the actual impact to determine of the existence of additional cultural resources.

In addition, it is questionable as to whether or not a permittee can be required to mitigate beyond the boundary of the project impact, or be held responsible for impacts that may occur in the foreseeable future that may be beyond their control. A possible example would be the collection of artifacts from sites near a mining area by a member of the general public who gained access to the site from the permittees project area.

The study area contains a large number of significant historic properties ranging from prehistoric camps to historic Carbonari sites. It is highly probable that far more sites exist in the Roberts Mountain area than has been reported. Protection of the resource, to prevent further deterioration of the scientific data base can be achieved in two way.

First, it is suggested that the existing MOA between the Atlas Precious Metals Inc, and the BLM be extended to cover all of the Roberts Mountain area and that it be applied to any surface disturbing event. In theory, any surface disturbing activity should discover, evaluate, mitigate or preserve significant cultural resources, providing the steps as outlined in the GENERAL SCHEDULE OF EVENTS are followed by the permittee (operator) and the agency (BLM). Application of the MOA will effectively counter synergistic or multiplicative direct impacts.

Tables 2 and 3 (Appendix B) list sites that have problematic locations or may be near enough to proposed impacts that they may to be ef-fected. The site locations should be field checked if future developments threaten impact. Application of the MOA would resolve the problem, noting the sites prior recording and promp-ting a procedural response on the part of the agency.

Second, it is recommended that the BLM address, either through in-house means or by contact, offsite (secondary) impacts that are bound to occur with the increase in surface development. It is suggested that the BLM inventory the remaining Roberts Mountain area, or at a minimum, an expanded boundary around current or future impact areas that have not already been inventoried to determine the type, and data recovery potential of the cultural resources. By doing so, the agency will have quantifiable data that can be reviewed in the future to determine the kinds and intensity of secondary impacts to the surrounding sites.

RECREATION

Exploration roads need to be closed and reclaimed to prevent access to fragile environments i.e. riparian areas, meadows, critical deer winter and summer range and sage grouse strutting grounds. Mining companies may be asked to provide reasonable equipment and manpower to assist the BLM in off-site development of recreational facilities. For example, a pool area on Roberts Creek would enhance the fishery resource, thereby improving the recreational values to anglers.

CHAPTER V: CUMULATIVE EFFECTS

For most elements of consideration in the CAR there is insufficient long-term data upon which to base definitive cumulative impact determinations. The complexity involved suggests the need for computer modelling, conclusive data sets, simulation and field verification before good predictability can be assumed. Cumulative impact assessment takes a broader view than conventional impact assessment; the boundaries, the number of disturbances, the geographic area and the time frame considered all tend to be larger (Preston and Bedford 1988). Baskerville (1986) and Clark (1986) have suggested that cumulative impacts occur in different ways.

Current thinking in California forests relative to Cumulative impact involves three phases; 1)the calculation of a sensitivity index for each region, 2) a compilation of information into a land disturbance history, 3) field investigations and 4) and evaluation based on the preceding three phases. This chapter attempts to do this although this effort has involved no new field work apart form that previously accomplished as a part of various field studies. In addition some new information has been obtained relative to the socioeconomic aspects of the region.

It is generally true that more than one pathway of cumulative impact is valid. For example Beanland and others (1986) have summarized five ways in which effects accumulate:

1. Time-crowded perturbations. Disturbances occur sufficiently close in time that the system does not recover in the time between.
2. Space-crowded perturbations. Disturbances overlap in space or occur so close together that their effects are not dissipated in the distance between.
3. Synergisms. The interactions of different types of disturbances produce effects qualitatively and quantitatively different from the individual disturbances.
4. Indirect effects. Disturbances initiate a chain of events that produce effects delayed in time or space from the original disturbance.
5. Nibbling. Disturbances produce effects by small changes, i.e., incremental or decremental effects.

The BLM has suggested several approaches to cumulative impact assessment. Based on these suggestions, each element has been discussed to judge the type of cumulative impact (piecemeal, slow degradation, offsite, homotypic, heterotypic or a combination of several) and the way the cumulative impact occurs (additive, synergistic, multiplicative, threshold or a combination). Also it must be remembered that not all effects are impacts. The term impacts connotes a value judgement and therefore goes beyond the effect which is causally linked to some source of influence.

The first impact type, piecemeal, is defined as a bit by bit depletion of a larger resource. Slow degradation is defined as a gradual decrease or destruction of the resource. One type of impact that is difficult to control or quantify is Offsite, occasionally referred to as "secondary" impact. Here, the impacts is the result of development away from a significant resource. The forth impact, Homotypic is the result of several developments of the same type. An example would be several mining activities such as leach pads, roads or mine portals completed by different companies in a general or defined area. The fifth type or Heterotypic is when several different types of development in the same area effect the resource

Of the ways that cumulative impacts occur, the first or additive effect is when several like impacts occur over a period of time causing the same level of diminutive effect to the resource. At any one point, the impact can be assessed by adding the incremental losses. A second way or synergistic cumulative impact occurs then several impacts from different types of projects occur effecting the resource that when combined, the total effect appears to be more than that caused by the single impacts added together. Multiplicative is a third category of ways for cumulative impacts to occur and is set in motion when the resource is exposed to a series of impacts over time. An example may the completion of one mining project, removing only four or five sites, while the next two projects impacts at a slightly lower number because there are proportionally fewer sites to impact. However, when added together, the impacts becomes substantial. At some point in time, a threshold is reached wherein the re-source is so adversely impacted or reduced that data recovery potential is gone. This could result if no efforts are made to protect or mitigate, and the resource, for all intend and purpose is gone.

To further assist in understanding the cumulative impact process we have developed a 10-scale cumulative effects score (CES) as follows:

1 - 3 Intense cumulative impact with synergistic or multiplicative effects. Often exhibits a threshold. Often homotypic or heterotypic. May require offsite mitigation. Time-crowded perturbations are common. Indirect effects may be significant.

4 - 6 Medium cumulative impact with lower levels of influence than for 1 - 3. Synergistic or multiplicative effects may or may not be present. May involve a threshold. Impact is less often homotypic or heterotypic and more often piecemeal or slow degradation. Time-crowned perturbations may be influential and indirect effects are probable.

7 - 10 Low cumulative impact. Mostly additive in nature. May be slightly multiplicative or synergistic if a threshold is exceeded. May not involve a threshold. Cumulative impact type is nominally piecemeal or slow degradation.

ENVIRONMENTAL IMPACTS AND CONSEQUENCES INCLUDING CUMULATIVE IMPACTS

VEGETATION

The environmental impact on vegetation is generally additive but may become synergistic with a threshold involved as increasing amounts of disturbed areas allow an increase in annuals and other less desirable species. This will lead to a continuous reintroduction of undesirable species such as *Bromus tectorum*, *Halogeton glomeratus*, and Russian thistle.

A continuing disturbance and opening up of potential invasion sites allows annuals and other less desirable species to increase in density. This greatly adds to the fire hazard of the area. Fire removes all or most of the vegetation, leaving the area exposed to run-off and surface erosion. With continual erosion it becomes more difficult for plants to become established, thus decreasing the stability of the soil in the area. Mass wasting, rilling and slumping may follow.

The removal and invasion of of introduced species also decreases wildlife habitat and livestock and wildlife forage and browse. Exploration road nets (closely spaced) will tend to decrease the use of the total area by livestock and wildlife.

It is clear that the most affected areas are associated with the U.S. Gold and Atlas Gold mine operations. The other 8 companies cumulative impact only an additional 71 acres. The cumulative impact is proportional to the degree of exploration and mining activities within the region. Maximum impacts are associated with ore extraction and processing. Vegetation is destroyed in each mining activity but can generally be replaced if good reclamation practices are followed. CES = 8.

OTHER MINERAL RESOURCES

Presently there is no development of other mineral resources. The cumulative impact is additive and based on one short access road through the sagebrush to an oil well drilling site in Kobeh Valley. CES = 9.

SOILS

On the average, the erosion potential of the soils in the region is low. Exploration and mining activities, including road building, results in soil disturbance and removal of vegetation which can lead to accelerated erosion if good restoration or reclamation practices are not practiced. The removal of vegetation is influential is this regard because of the removal of the stabilizing affects of roots in the soil.

Unrestored sites can contribute to sedimentation of streams. This is especially valid with Roberts Creek because of its critical nature in the region and susceptible to threshold sedimentation. This stream and canyon is an area of high usage.

Soil erosion is both homo and heterotypic and generally additive in terms of cumulative effect. With adequate restoration procedures, soils need not erode in the region. CES = 9.

PALEONTOLOGY

Little thought has been given to the impact on paleontological resources. Mining activities may destroy potential paleontological resources before specimens can be collected cataloged and classified. The cumulative impact is a matter of slow degradation and is additive in nature. CES = 6.

RANGE MANAGEMENT

The impacts already are at a significant level. The significance will increase with preposed new activities but at a slower rate since much of the alteration to lifestyle, animal behavior and management has already occurred. The cumulative is multiplicative and, in some ways is synergistic, since the effects are more than just physical. The social aspects of such effects are often overlooked.

Relative to range management, the allotments will be impacted by the removal of forage. More importantly, the southern permittee will be required to change management methods especially for the sheep operation. The productive sheep operation may have to be reduced by as much as 33 percent and the cattle operation by as much as 10 percent. Mitigation will require more intensive and costly management by both the permittee and the BLM as well as possible off-site mitigations provided by the mining company.

Range management is impacted in a piecemeal fashion by both the removal of vegetation and the development of features that require changes in time-tested range management practices, e.g., movement of livestock between summer and winter ranges. This can result in a synergistic impact type. CES = 4.

WILD HORSES

Wild horses are by definition a non-resource within the region and will remain so unless their numbers are allowed to increase within the CAR. CES = 10.

WILDLIFE

MULE DEER

Mining activities can have an impact on important seasonal migration routes used by mule deer. The haul road proposed by Atlas and activity along it may act as a barrier to seasonal migration of mule deer along observed traditional routes. Due to limited winter range on Roberts Mountains, most wintering deer migrate to different areas. Two migration routes are bisected by this proposed haul road. This may result in deer mortality along the haul road. The easternmost of these migration routes (near Roberts Creek) runs through the area of the proposed low grade ore heap leach. Any toxic cyanide must be made unavailable to deer as well as other wildlife.

Cumulative loss of winter range and summer range habitat due to mining exploration activities could also adversely impact the deer herd (Table 28). Summer range will be greatly affected by the overall increased activity from mining. This could affect the deer by either "packing" them into undisturbed summer range or forcing them to move into other adjoining ranges. This may indirectly create a problem in other mountain ranges. The loss of deer winter range is low but may be significant. Most of the deer that winter on Roberts Mountains stay in the area of the proposed Atlas satellite project. Displacement of deer to other areas of Roberts Mountains could impact grazing or carrying capacity of these ranges. Increased access in the area may bring about increased hunting pressure and harvest during deer season which can be generally controlled by the number of tags made available. There may also be a greater demand for deer tags followed by increased game law enforcement problems associated with a greater number of humans in the Roberts Mountains.

TABLE 28: DEER SUMMER AND WINTER RANGE DISTURBANCE (ACRES)

	Summer Range		Winter Range	
Existing Disturbance*	57.5		75.5	
Estimated Affected Area**		172.5		113.3
Proposed Disturbance	671.2		9.7	
Estimated Affected Area		2013.6		14.6
TOTAL	728.7	2186.1	85.2	127.9

Total existing and proposed disturbance: 813.9
Total estimated affected area: 2134

* - Does not include reclaimed areas.
** - Factor of 3X for summer range and 1.5X for winter range.

There may also be an impact on the BLM's Roberts Mountains Habitat Management Plan. Big game habitat study areas in Meadow Canyon, Pete Hanson Creek, Roberts Creek, and Willow Creek spring may be affected by increased mining and exploration activity. Increased wood-cutting in pinyon/juniper stands would release understory shrubs, forbs, and grasses to improve mule deer range. This may also bring about an increase in undesirable plant species (i.e. cheatgrass) which would decrease forage value.

SAGE GROUSE

The proposed Atlas haul road could impact movement of the grouse and broods from the nest sites to the brooding areas.

Strutting grounds in the area that could be affected by mining, exploration, and recreational activities are the Roberts Creek, Grubb Flat, Three-Bar, and McClusky Pass strutting grounds. The Three-Bar strutting ground is located at the current Gold Bar mill location. Grubb Flat and Roberts Creek strutting ground may be impacted by traffic through the area or by movement of the birds into areas that will be influenced by the satellite expansion. Table 29 indicates the amount of activity at these strutting grounds in recent years. Sage grouse moving to higher elevations from the Roberts Creek strutting ground may be subject to potential poisoning hazards by the heap leach pad. The sage grouse have moved south from the strutting ground on the existing Gold Bar mine site and their movements may be affected by the proposed Atlas haul road. The grouse utilizing the strutting ground located on the Three-Bar road (Grubb Flat) may undergo increased road mortality due to higher levels of traffic. The increased population of surrounding communities (Eureka, Elko) as a result of mining could also increase sage grouse harvest in the Robert Mountains area.

TABLE 29: STRUTTING GROUND ACTIVITY

Number of Strutting Sage Grouse Observed/Strutting Ground

Year	Three-Bar	Roberts Creek	Grubb Flat	
1980	79	23	11	
1981	48	49	*	
1982	54	30	*	
1983	51	33	*	
1984	56	52	9	
1985	61	41	*	
1986	52	51	16	
1987	42	46	*	
1988	29	49	*	
1989	18	25	*	?

* - Not Surveyed

Traffic along Roberts Creek Road to claims in the southeast may disturb the Roberts Creek leks. Disturbances from Atlas mines and recreational activities in strutting grounds may result in an overall reduction in breeding activities and sage grouse population. The strutting ground near McClusky Pass could suffer similar reductions from U.S. Gold/Silver State activities. This may also be the case for two new strutting grounds which were found in Sections 17, 18, and 20 of T.23N., R.51E., in 1989 surveys.

Brood rearing areas in the southern part of Roberts Mountains near Roberts Creek, may be affected by activities from the satellite expansion and exploration activities of Santa Fe, Nerco, and Pegasus. The brood rearing area above Cottonwood Canyon is located on Nerco's Keph claim block which has a proposed disturbance of .55 acres. Tonkin Summit brooding areas may be influenced by mining and exploration activities of the South Tonkin project.

RAPTORS

In the proposed Atlas satellite expansion, raptor nesting in the surrounding areas could be affected by human activity and loss of habitat from mining activities. No known active nests were documented in the area of the proposed satellite pits and dumps. It is unknown how ridgeline alteration affects migration of raptors. There is also potential to enhance raptor populations by correct reclamation procedures. Most of the active nest found in the BLM survey are located in the Roberts Mountains WSA. Nesting sites could be disturbed by Asarco, Pegasus and Phelps-Dodge activities.

FISHERIES

Fishing pressure will increase with the increased population of the surrounding area. Roberts Creek will be the most affected since it is surrounded by the majority of the mining activity and parallels Roberts Creek road. The proposed mine sites and dumps of Atlas could adversely impact Roberts Creek during periods of extreme thunderstorms. Sediments and rock washed down the drainages into Roberts Creek would affect water quality and reduce the spawning efficiency and survival of trout.

Any disturbance in the southern claim block of U.S. Borax may cause sedimentation of Vinini Creek. Pete Hanson Creek may be disturbed by Pegasus and Asarco activities. Any disturbance could endanger the Lahontan cutthroat population. Removal of water from streams for drilling purposes may accelerate drought conditions and degrade stream condition. The wells proposed by U.S. Gold/Silver State may adversely lower Tonkin Springs to a level intolerable to fish.

With the recent closure of Tonkin Reservoir increased fishing pressure may be exerted on surrounding creeks. The small population of Lahontan cutthroat in Pete Hanson Creek may be further threatened. The Tonkin man camp may lead to increased fishing pressure on Tonkin Spring.

Overall the cumulative effects are significant. They impacts are both homotypic and heterotypic and tend to be synergistic, at least in the case of sage grouse. Thresholds may be reached with mule deer winter range. It is likely that wildlife should receive several CES ratings. For example, sage grouse with a CES = 3; mule deer, CES = 5; raptors with a CES = 8 and fisheries with a CES = 4. Overall wildlife should receive a CES or 5.

THREATENED AND ENDANGERED SPECIES

The Lohontan Cutthroat trout population in Pete Hanson Creek could be adversely impacted through increased sedimentation, loss of streamside habitat, decreased water flow and introduction of pollutants. This stream and any stream slated for reintroduction of Lahontan Cutthroat trout should be closely monitored. Since their are no known nesting populations of Peregrine falcons or bald eagles, there should be little impact from increased mining activity. Nesting sites could increase with the creation of cliffs from open pit mining. Impacts on threatened and endangered species are not critical within the region. CES = 9.

FORESTRY

The effects on forestry include reduction of available fuelwood, posts, Christmas trees, and pine nuts. There is also a loss of wildlife cover and a possible reduction in habitat with the removal of vegetation. However, if perennial plants increase with the removal of trees, habitat can be increased for some animals. Another benefit of tree removal is an increase of habitat edges which benefits certain species, but may reduce habitat for tree-dwelling species.

The removal of trees can also increase fire hazard as the more resilient trees are replaced with more combustible grasses. This may also increase the erosion hazard in the area. The removal of trees increase visual contrast reducing the aesthetic appeal of the area.

An increase in population increases the chances of unlawful harvests, such as of cordwood. The increase in dust (which may be cumulative with an increase in erosion hazard) can be detrimental to the trees. Dust may cover some trees to the extent that photosynthesis is impaired.

Much of the impact on forestry can be mitigated with appropriate and ecologically successful reclamation procedures. CES = 7.

WILDERNESS

The primary effect of Mining on the WSA is a visual impact (from dust and mining activities). These visual effects compromise wilderness values of sight, sound and privacy. Another minor effect is from Asarco who had an exploratory drilling program inside the Wilderness Study Area (east side of Willow Creek). About 12 holes have been drilled using low-impact vehicles such as track-mounted drill rigs, with no major surface disturbance. Taseko has also drilled within the WSA. Select areas of both parties have been reclaimed as of 1988 and no current activities are proposed. CES = 7.

RIPARIAN

Exploration roads through riparian and meadows can disrupt wildlife inhabiting riparian areas. Vehicular traffic can create gullying and destroy streambanks as well as scar and destroy meadows and riparian areas. Dust created by vehicles may lead to dust coatings on riparian and other vegetation which may inhibit photosynthetic activity. Heavy foot traffic from recreationalists and mining activities can compact soil and cause a loss of riparian areas.

Riparian areas may decrease upon removal of water used for drilling purposes from springs, wells, and streams. Wells and Tonkin Spring utilized by the Tonkin mine may reduce riparian located along Denay Creek. Hycroft also obtains water from Tonkin Spring. Similarly, Vinini Creek and Henderson Creek may be affected by removal of water for drilling by Asarco. Riparian areas of Roberts Creek would be most impacted by such removal since its water is used by Pegasus, Nerco, Asarco, and Atlas. Phelps-Dodge and Atlas utilize water from Cottonwood Creek. Phelps-Dodge proposed disturbance of 12 acres will affect the upper portions of Rutabaga Creek, Cottonwood Creek and an unnamed tributary to Tonkin Spring Creek and result in increased erosion and sediment load thus affecting riparian condition. Henderson Creek riparian areas may be directly affected by U.S. Borax activities and their nearby road could impact Frazier Creek.

Riparian zones may be significantly impacted unless almost extraordinary measures are taken to mitigate. CES = 2.

AIR RESOURCES

Air quality is affected by dust and vehicle emissions and will increase as transportation and land disturbances increase. These impacts may be at least partially alleviated by paving, dust abatement chemicals added to the soil (although problems may ensue with the increase of an already high pH) , and water. The water can either be hauled by truck or by pipelines along the haul roads connected to moving sprinklers.

Fugitive dust from activities at the mine sites and along roads. Potentially, the major area of fugitive dust is the nine mile haul road of Atlas and the four mile haul road of the Tonkin mine.

Cumulative impact on air quality is a linear relationship. As mining increases, dust increases. As this combines with added automobile and equipment emissions, the result is a degradation in the atmosphere. In the Roberts Mountains region this impact can be classified as being weak. CES = 8.

VISUAL RESOURCES

There are two kinds of people who will notice the impacts on visual resources. First there are "Highway people". These are the people who casually notice the landscape around them as they drive by. For them, there will be short term affects that, if properly mitigated, will leave no long term affect.

The second kind of people are the "Dispersed recreationists" who will see long term affects such as pits when they backpack, camp, fish, etc. Off-road vehicles also cause a huge impact to the visual resources. there is already a lot of impact to the Roberts Creek and 3-Bar Road. There will always be scars, especially from open pits and waste dumps. The simple fact is that the more changes that are made, the more we will see them. CES = 5.

WATER RESOURCES

Without baseline data, it is difficult to know the true effects on the various streams. For this reason, it is important that this baseline data be gathered as soon as possible.

There is a danger of exploration holes hitting artesian aquifers in the area. The more holes that are drilled, the greater the chances are for this. These drill holes run the risk of contaminating ground water.

Increased land disturbance in the area adds to sedimentation of local streams which could eventual exceed the level at which the stream can sustain life. Mitigation efforts should be successful and many impacts can be either reduced or circumvented. CES = 6.

SOCIOECONOMICS

The impacts on socioeconomics are largely the result of increased population. Health care, schools, utilities, housing, employment, welfare, law enforcement, fire suppression, community services, water and waste water, pollution (air, water, noise, litter), transportation, and regulatory agencies are all impacted. The impacts are largest during the construction phase when the transient population is highest.

The greatest impacts often occur after the mine stops production. This is usually called boom and bust and in the worst case can lead to a complete collapse of the community.

Assuming the need for one housing unit per employee, the housing demand created by exploration and mining expansions in the CAR Area is great. There are virtually no rental units available or conventional houses for sale, therefore, all housing would have to be brought in or constructed on existing developed lots.

The new Eureka County Justice Facility is adequate to meet the growing needs of the county sheriff's department. However, staffing has been and probably will continue to be a problem. Likewise staffing of rural health facilities has become an issue of concern in many areas, and Eureka County is no exception. As mentioned in section 2.13 the Eureka County School District is also having a problem filling staff positions.

The addition of up to 120 people to the Eureka area could have the effect of further taxing these already understaffed services. On the other hand, growth in the community could attract people with these much needed skills to the area.

The primary socioeconomic impact of expansion of exploration and mining activity in the CAR Area actually results from continuation of operations and development of new operations. Eureka County has no zoning regulations or building codes, however any new construction in the town of Eureka is limited by the lack of water hookups (see Utilities below). Rental housing and conventional homes for sale are virtually non-existent. Although housing is in demand, investors seem reluctant to make long term commitments in an area that is primarily dependent on the mining industry. Developed mobile home lots constitute the majority of the housing opportunities.

Nearby Diamond Valley has several subdivisions with lots for sale, however individuals must develop their own water in this area. There are 5 hotels and motels near the town of Eureka with a total of 80 rooms. Occupancy averages 100 percent in the summer months and 30 to 70 percent in the winter.

Water and sewer services for the community of Eureka are supplied by the County Department of Public Works. In 1981 new evaporation and percolation ponds for the service system were constructed with a design capacity to serve approximately 1,000 people. At the present demand level, the sewage treatment system could serve approximately 500 more people (personal communication, L. Fiorenzi). Ten additional acres of land have been acquired from the BLM for expansion of the system as needed.

The water system in Eureka is currently at capacity. Any new construction is dependent upon completion of a new water system. No new water hookups are being allowed until the system is in place. A new well has recently been drilled to deliver an additional 800 gallons per minute (gpm) to the water system. The county is in the process of taking bids for construction of the associated delivery system expansion. The project is expected to be complete by September or October of 1989. The new well and delivery system will increase the number of meter hookups from the current 205 to 455.

Electric power is supplied to Eureka by Mt. Wheeler Power, Inc. Any reasonable increase in power demand in the region would be within the capacity of the system.

Law enforcement in Eureka County is provided by the county sheriff's department and one Nevada State Highway patrolman stationed in the area. The Eureka County Sheriff's Department currently has a staff of eight officers. Positions are open for two deputies and two jailers. There has been a chronic shortage of deputies and the department has not been fully staffed for four years (personal communication, K. Jones). The staff shortage and a relativel high turnover rate may be attributed in part to a low pay scale compared to other law enforcement agencies and security positions in the private sector.

The sheriff's department is housed in the new Eureka County Justice Facility which also includes the District Attorney's office and the county jail. The jail has a capacity of 20 and the average daily population is approximately 5 inmates. Department records show an increase in violent and drug related crime over the past four years (personal communication, K. Jones).

The Eureka County Medical Clinic is managed by the Central Nevada Rural Health Consortium. A resident family practice physician and registered nurse (husband and wife) provide care to approximately 20 patients per day. The clinic is well equipped with cardiac defibrillation apparatus, x-ray, and a laboratory. Cases unable to be handled at the facility are generally referred to Elko General Hospital or occasionally to William B. Ririe Hospital in Ely.

Emergency medical care and transportation is provided by the Eureka County Volunteer Ambulance Corp. The organization operates two ambulances equipped for basic life support and has 20 to 24 active EMTs. There is a need for more advanced training for volunteers, and the organization is looking into EMT II certification for some of its members.

The area covered by the volunteer corp is loosely described as southern Eureka County, however calls have been answered in Lander and White Pine counties as needed. The corp responds to an average of 2 calls per week. Approximately one-half of the calls are related to automobile accidents. When ground transportation of accident victims is not possible due to distance and/or severity of injuries, Care Flight or Life-Line fixed wing aircraft are used to fly patients to Reno or Salt Lake City.

Eureka County School District operates two schools in the town of Eureka. The elementary school (K-6) and the high school (7-12) had spring 1989 enrollments of 120 and 90 respectively. The capacity of the elementary school was increased to approximately 200 students by eliminating the art and music rooms and using the space for classrooms (personal communication, R. Casey). Plans are currently in place to build a new elementary school gymnasium and convert the old gym to two additional classrooms. Funding for the project will come from the district's capital projects fund. The capacity of the high school is 135 students including one mobile classroom unit. There are no plans for expansion of high school facilities at this time.

The student/teacher ratio for the Eureka County School District is approximately 12:1. The district plans to hire two new teachers for first and fourth grades this fall, however it has been difficult to find teachers willing to work in this rural area and the shortage of housing has presented a problem in recruitment. Housing reserved by the school district for teachers is currently full.

Socioeconomic impacts will be continued increases in revenue to Eureka, Eureka County, Elko and Elko County and Battle Mountain and Lander County from present and potential mining activity in the region. These effects will include payroll, taxes and certain negative impacts dealing with housing, law enforcement and schooling. Housing costs will increase for new workers with families because they will have to buy or move a new trailer home into facilities now under construction. School system needs will be for new teachers and classrooms for K-12 in Eureka. For law enforcement increased costs will be for patrolling, overtime, increased staffing and the purchase and maintenance of patrol vehicles.

The overall impact to socioeconomic activities within and service areas near the region will be potentially high. The cumulative effects are primarily synergistic and/or multiplicative and of a heterotropic kind. CES = 3.

TRANSPORTATION

The environmental impacts will be related primarily to the number of major ingress-egress roads found in the region and the number of vehicles moving in and out of the area. Consequences may include an increased need for law enforcement officials, regulatory officials, and garbage removal. There will also be more grading and road disturbance, as well as snow removal in the winter. Due to the sensitivity of many of the areas, snow removal should be done by snow blowers, snow plows or small CATs. Snow removal by DC-8 CATs can be very destructive especially when boundaries of snow-covered roads are hard to locate. This could be critical in riparian areas.

Impacts on wildlife will be synergistic and may become severe as more land is removed from the habitat areas. Ease of movement across roads could also be impeded, especially heavily used ones. This may lead to a possible decrease in reproduction as well as a reduction in variability in the gene pool. Harrassment of animals, whether intentional or accidental, may also adversely impact wildlife.

Air quality will also be affected. Vehicle emissions and dust accumulation will increase as the amount of roads and traffic on those roads increases, thus causing a slow degradation of air quality.

New roads will increase access to the entire region. The recreationists utilizing such access will cause cumulative impacts on camping sites, riparian areas, streams, livestock operations, and wildlife populations. Increased off-road vehicle use will affect vegetation, grazing or forage use and wildlife habitat. The Roberts Creek area will receive a considerable increase in traffic effects because it provides access to claims located in the southeast portion of the region.

Man camps create and an easing of some problems and an intensification of others. At this time, there is one permanent man camp, the Tonkin Man Camp, approximately 2 miles east of the Tonkin Mine and one temporary camp owned by Nerco located within their Hunter claims (T22N, R51E). The Nerco man camp consists of a 28 foot travel trailer. The only relative impacts it has are on the roads which were utilized to bring it in workers and any disturbance from employees around the camp, e.g., trash vegetation destruction and other impacts. Because of its small size the Nerco Man Camp's effects are minimal.

The Tonkin camp, on the other hand, is much larger covering 20 acres. Some of the problems brought forth by the camp include dust, garbage, noise and air pollution, and excess people.

However, the presence of the camp may reduce some problems om the surrounding communities; there are less people driving back and forth on the roads and less people in the outlying regions to contribute to garbage, crime, noise, etc.

The close proximity of the Tonkin Ranch to the Tonkin Man Camp has lead to numerous complaints by the family involved, an obvious affect on their accustomed social life, destruction of property, and harrassment of livestock. The best example, of some of these problems is the Tonkin Reservoir. Although privately owned, it has been a traditional fishing hole open to the public for years. Due to problems with the fences, vandalism, noise, and lack of care for the area, the reservoir is now closed to the public.

Transportation associated with exploration and mining activities in the region will increase. The effect could exhibit a threshold as traffic increases in the future. A synergistic effect may become apparent as new roads, increased traffic, increased access impact numerous other resources including wildlife, air and visual quality, water resources and riparian zone impacts. CES = 4.

POWERLINE DISTRIBUTION

Powerlines, with the addition of raptor protectors, add habitat for raptors in the form of perches, resting sites and hunting observation posts. As the mining activity in the area increases, the addition of more powerlines will eventually detract from the habitat.

Visual impact is small, but an impact nonetheless, especially to users of the WSA.

The overall level of cumulative impact is piecemeal likely a combination of threshold and additive. At some point in time the number of powerlines may reach a point where the level of visual impact will be considered objectionable. CES = 8.

CULTURAL RESOURCES

The immediate issue concerning cultural resources in the Roberts Mountain area is the impact that will occur to sites that have potential to yield significant historic and scientific data from the proposed mining activity.

An example of piecemeal cumulative impacts would be the occasional removal of a carbonari site from the large number known to exist within the research area.

Slow degradation of a cultural resources would occur as various projects develop that cause impact to the whole. An example would be the removal of a few diagnostic artifacts by relic collectors, impacts of a few features by vehicles, disruption of the surface, causing erosion to encroach upon a site boundary. While the act of any one impact is not highly significant, continued impacts act to degrade the whole over time.

As new highway or access opens an area otherwise generally not accessible then an offsite impact would occur. Increases in visitation by more people make the resource move vulnerable and relic collection increases.

A possible example of a heterotypic cumulative impact would be the combination of mining activity and perhaps timber cutting that would impact carbonari sites.

An additive impact would occur as more and more sites are destroyed. Synergistic cumulative impacts would occur, e.g., as impacts by grazing or relic collection brought on by increased access, and the impacts caused by construction of leach ponds. The first may impact 2-3% of the resource while the latter 10%. Singly, the impacts may be small, but when combined, a large portion of the resource is effected and valuable data is irretrievably lost.

The difficulty comes in trying to apply the various definitions to the Roberts Mountains area. It can be assumed the piecemeal, slow degradation and offsite impacts have been occurring over several decades. Cattle grazing, private relic collection, occasional impacts from energy and mineral developments, natural erosion of site surfaces occurs constantly. In fact, the formation of the carbonari sites may have caused impacts to prehistoric sites. It simply is not possible at this time to determine which impact or combination of impacts have had the greater effect, and even determining the level of impact by any one of these activities is not possible in the study area.

From a cultural resource perspective, the impact to the study area is best viewed as heterotypic. Roberts Mountain has been, and in all probably will continue to be, impacted by several different land uses. The immediate future holds the probability of heavy impacts from mining and exploration, while in the longer term, recreation, wood gathering, grazing, and natural erosion will continue to degrade the quantity and quality of the cultural resource data base. The difference in the way the impacts occur, be it synergistic or multiplicative, seems mute-the resource is still being impacted at a significant rate, which if left unchecked or nonmitigated, will have a substantial negative effect on the regions cultural resource data base. CES=3.

RECREATION

With the addition of people and ease of access, there will be a shift in the type of people who use the area recreationally. There will be less of the serious outdoorsmen and more of the casual. With this comes an increase in litter and an overall degradation of the area, especially in riparian areas.

Increased activity from recreational activities of mine employees in the immediate area along with the growing populations of Eureka and Elko will be felt in the Roberts Mountains. The increased human activities would produce an overall reduction in wildlife habitat and an increase in litter, air pollution, noise pollution and fire hazard. The increase in exploration roads would result in increased access to otherwise inaccessible areas thus leading to further degradation of the environment. Woodcutting access will increase with exploration road construction. Traditional access roads may be blocked by mining or other related development causing a direct effect on recreation.

Hunting may be displaced to other areas in close proximity due to recreational intrusion and a corresponding decrease of animal use in areas of heavy use. Since hunting contributes to the majority of visitor days, the cumulative effect may be reduced visitor days in the area as a whole. An indirect effect would occur if mining projects create a long term change in grazing and migration patterns of deer herds, thus affecting deer hunters. Exploration and haul roads passing between the sage grouse strutting grounds and brooding areas may have an indirect effect on grouse hunters by causing long term changes in sage grouse populations. Grouse population reductions in Eureka

County have resulted in hunting restrictions or closing of the area to hunting in the recent past.

Fishing pressure due to an increase in population of the area may lead to the need for additional fish stockings. Increased foot traffic along streams and through riparian areas from fisherman, goldpanners, and picnickers would lead to compaction of vegetation and soils and erosion of streambanks. An undesirable visual impact to anglers, hunters and naturalists from mine development is expected. Wildlife law violations may increase causing a need for additional law enforcement.

Off-road vehicle use would lead to increased erosion, sedimentation of streams, and an increase in road deaths of wildlife. Snowmobiling may affect (stress) deer when they are at their lowest condition (winter season). Rockhunting activities may produce conflict with claim holders.

Recreational activities may also reduce the aesthetic value (visual intrusion) of the Roberts Mountains WSA through noise pollution, air pollution and reduced privacy. Project development would decrease the sense of remoteness in the WSA area as well as the Roberts Mountains area. CES = 5.

CHAPTER VI: OVERALL CUMULATIVE IMPACTS IN THE ROBERTS MOUNTAINS REGION

The Roberts Mountains Region is an important area of environmental concern. It is likewise an area of considerable mineral wealth. The soils and vegetation of the region produce forage and browse for livestock and wildlife, several streams support fisheries and riparian vegetation. The region has diverse topography, vegetation and numerous resource uses. A proposed wilderness area has been designated and cultural resource sites are abundant. The region is an area used for hunting, outdoor recreation and solitude. The air resources have always been of high quality.

Pinyon/Juniper woodlands in the region provide forest products. Few threatened and endangered species are found. Water quality has been good and soil erosion has generally been nonexistent on undisturbed sites.

In recent years various mining companies have located their exploration activities in the region. Two companies are extracting and processing precious metals. New roads have been built and powerlines, mills and man camps have been constructed.

The movement of people, machinery and supplies has increased. Now the questions are being asked, what is the level of impact and with numerous activities what has been the cumulative impact. This report has summarized, in so far as data sets will allow the cumulative impact felt over this 250,000 acre region as a result of escalated legitimate mining activities. Table 30 presents a summary of the cumulative effects scores (CES) for each element considered in the report.

TABLE 30: THE CUMULATIVE EFFECTS SCORES (CES) FOR 18 DESIGNATED (BY THE BLM) RESOURCE ELEMENTS IN THE ROBERTS MOUNTAINS REGION

Vegetation	8
Other mineral resources	9
Soils	9
Paleontololgy	6
Range Management	4
Wild horses	10
Wildlife	5
Threatened and Endangered Species	9
Forestry	7
Wilderness	7
Air resources	8
Visual resources	5
Water resources	6
Socioeconomics	3
Transportation	4
Powerline distribution	8
Cultural resources	3
Recreation	5

The cumulative effects of the mining and associated activities have had the greatest impacts on range management and ranching, wildlife, visual resources, water resources, socioeconomics of nearby communities (primarily Eureka), cultural resources and recreation. Effects on vegetation, paleontology, forestry, wilderness, wilderness are intermediate in nature. Little cumulative effects, at least at this stage, have impacted soils, wild horse or air resources.

It is clear that the cumulative effects have been increasing in past years and are now greater that at anytime in the past. The effects will almost certainly increase in the future. Therefore the strongest recommendation that can be made is to develop a strong, viable monitoring program along with concurrent, ecologically based, reclamation.

By definition, cumulative impacts are additive in the summation of their total impact on an area. Of the 18 BLM designated resource elements involved in the CAR, each carries a different weight or value in the summation of the total impact. For example, a detrimental impact on the soil, which in reality is the basic resource, would have an area-wide consequence far greater than say an impact on other mineral resources. In an attempt to classify individual resource elements and their interaction with the total cumulative impact, the following ranking system was used:

Description	Points	Elements
1. Extremely important element, area-wide	10	Soils
2. Very important element, occurs mostly throughout the area.	8	Vegetation Wildlife Threatened & Endangered Species
3. Important elements, occur periodically throughout area	6	Cultural Resources Water Resources
4. Economic or closely related elements	4	Forestry Range Mgmt. Other Mineral Resources Recreation Socioeconomics
5. Minor elements, or elements occurring sporadically throughout an area	2	Paleontology Wild Horses Wilderness Air Resources Visual Resources

The basic resource in any ecosystem must be the soil. Loss of the soil structure will ultimately result in the loss of all of the other resources. Conversely, impacts on any of the many other individual resource elements may well ultimately effect the soil. Therefore soil was given the single highest value or cumulative factor (CF) of 10.

Nearly as important would be those resource elements closely associated with the soil throughout the area. The obvious prime example would be vegetation. Wildlife, which normally occurs throughout the area in one form or another would be nearly as important. An argument could be made that wildlife is less important than vegetation, because it is basically dependent on existing vegetation, therefore it should not receive as high a CF as vegetation. However, because wildlife is also dependent upon water resources, which represents another line of possible cumulative or additive effects, it is considered equal to vegetation. A third element, threatened and endangered species, was also given equal ranking. Threatened and endangered species, could exist throughout an area, and obviously would be dependent upon the soil, vegetation and water, or more correctly stated, the stability of the ecosystem. Due to the significance of the loss of threatened and endangered species, it was considered to be equal to vegetation and wildlife. These three elements were given a CF of 8.

Next in importance would be those elements that occur periodically throughout the area. They would also be the type of elements that still would exist in some form, almost regardless of the impact. This is not to say that an impact of sufficient magnitude could not almost completely eliminate the element at any given point, but generally the element would continue to survive in one form or another. Elements considered at this level were cultural resources and water resources. These two elements were given a CF of 6.

Economic or closely related elements were assigned the next level of importance. Obviously to the individual being economically impacted a CF of considerably higher magnitude would seem appropriate. However, economic impacts which may be harmful to the overall socioeconomic values of an area could conceivably be beneficial to the biological ecosystem. Further, man has continuously demonstrated the ability to recover from economic impacts at a much faster rate than has the biological ecosystem. Elements considered at this level include forestry, range management, other mineral resources, recreation and socioeconomics. These elements were given a CF of 4.

The final level of impact included those minor elements occurring sporadically throughout an area or not deemed important to the overall health of the ecosystem. These include paleontology, wild horses, both air and visual resources, and wilderness. An argument could be made to place wilderness at a higher level, however, wilderness by its very nature should be protected from many of the additive impacts of the other elements, therefore the cumulative impacts occurring within a wilderness area should theoretically be minimal. These elements were given a CF of 2.

The elements of transportation and powerline distribution, considered in the text, were not considered in this ranking as they are in fact causative factors, and as such, their impact would be directly felt by the impacted resource. For example, a road (transportation) that disrupts a riparian area will have a direct impact on water resources, and as such, will be considered under water resources.

The following table summarizes the cumulative CES scores of the various elements, taking into consideration the CF values.

TABLE 31: CUMULATIVE CES SCORES

RESOURCE ELEMENT	CES	CF	CFS*
Soils	9	10	90
Vegetation	8	8	64
Wildlife	5	8	40
Threatened and Endangered Species	9	8	72
Water Resources	6	6	36
Cultural Resources	3	6	18
Range Management	4	4	16
Forestry	7	4	28
Recreation	5	4	20
Other Mineral Resources	9	4	36
Socioeconomics	3	4	12
Paleontology	6	2	12
Wild Horses	10	2	20
Wilderness	7	2	14
Air Resources	8	2	16
Visual Resources	5	2	10
TOTAL CFS			504

* CFS is the Cumulative Factor Score, obtained by multiplying the Cumulative Effect Score (CES) by the Cumulative Factor (CF).

Using this system, the total maximum points obtained would be 760. A score of 90% of that (684) would suggest that the total cumulative impacts within a given ecosystem are minimal and manageable. However a score of 50% or less (380) would suggest that the cumulative impacts are very significant, and so unmanageable that the area would have to be considered a sacrifice area if continued activity were permitted. The present score of 504 represents 66% of maximum, which gives a mathematical value to what the preceding discussion has suggested, that is, that the impacts throughout the system are becoming cumulative to the point of reaching area-wide significance. It is hoped that this approach might be useful for comparing cumulative effects from area to area.

It is obvious that the cumulative effects in the Roberts Mountains area have been increasing in past years. The effects will almost certainly increase in the future, and without mitigating efforts, the resulting CFS will continue to approach the 50% level. Therefore it is imperative that strong action be taken by management agencies to develop positive viable monitoring programs along with concurrent sound ecologically-based management and reclamation programs.

CHAPTER VII: CONSULTATION AND COORDINATION

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Mike Clark, Labor Economist, Carson City

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Paul Billings, Superintendent of Schools
Neil Harris, Undersheriff
Bill Welch, Administrator, Elko General Hospital

Lander County,Nevada
School District
Dr. Leon Hensley, Superintendent
Diana Smith, Accounts Payable

Sheriff's Department
Stephen M. Bishop, Sheriff
Marvin Adams, Undersheriff

Assessors Office
Georgia Lauritzen, Chief Deputy Assessor

Auditor and Recorder
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Water and Sewer Department
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City of Battle Mountain
General Hospital
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Kathy Ancho, Personnel Director

Volunteer Fire Department/Ambulance Service
Ron Unger, Fire Chief

Battle Mountain Realty
Pat Campbell, Broker

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Ferron Konakis, City Engineer
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APPENDIX A: RECLAMATION

The primary objective of reclamation within the CAR area will be two-fold: 1)to minimize or eliminate public saftey hazards and 2) to restore the land to a beneficial use which is consistent with local land use objectives. On sites where activity levels prohibit this level of reclamation, appropriate alternative plans will be developed to establish an acceptable level of reclamation. Reclamation activities will not only be site specific, but designed to prevent further degradation of adjacent sites.

SPECIFIC OBJECTIVES AND PROCEDURES

TEMPORARY ROADS

Temporary road construction will consist of side casting top soil adjacent to the roadway which creates a berm for safety, but more importantly stores top soil adjacent to the site for reclamation. Once activity has been completed roads will be reconstructed to existing slope, precluding any additional form of vehicular traffic. Top soil will be uniformly redistributed to a minimum of six inches. Slopes will approximate original contour where practical. Special attention will be applied to any road crossing intermittent or permanent waterways. Scarification will not be necessary on temporary road reclamation.

Revegetation will include hardy perennial bunch grasses and appropriate forbs to maximize forage cover for rapid soil stabilization. No attempt will be made to duplicate native vegetation, instead emphasis will be placed on secondary succession occurring. (Note: Do to the narrowness of the temporary road disturbed areas, less than 30 feet, secondary succession of adjacent native plant materials is maximized). Soil amendments will not be required. Seeding will be accomplished by broadcast, followed by a light drag so that seed is covered by approximately 1/4 inch of top soil, but not exceeding 1/2 inch. Light, all terrain vehicles may be used for seeding until slope becomes prohibitive, then seeding will be accomplished by hand. Seeding will be done between September 25 and November 30 in order to take advantage of winter and spring precipitation. Two seeding mixtures will be used, depending on elevation and site. Generally sites at lower elevation (below 7,000 feet, mostly along the haul road) and south facing will receive mixture A1, while those at higher elevation (above 7,000 feet) and facing north will receive A2. Seeding mixture will be designed to provide 75 pure live seeds (PLS) per square foot of reclaimed site.

Mixture will be as follows:

A1:	Ephraim crested wheat	33.3%
	Yellow sweet clover	33.3%
	Small burnett	33.3%
	total	100.0%
A2	Nordan crested wheat	25.0%
	Mountain brome	25.0%
	Idaho fescue	10.0%
	Small burnett	25.0%
	Yellow sweet clover	15.0%
	total	100.0%

PERMANENT ROADS

Permanent roads are those that are required for the life of the project. Cuts, banks and all adjacent sites to the roadway will be reclaimed concurrently, using the same principals and procedures as outlined under temporary road reclamation. Special attention will be given to runoff water management to minimize subsequent impacts on adjacent soil and existing vegetation. Revegetation of cut/fill areas will begin during the same year as construction to enhance rapid reclamation and minimize impacts. This will be accomplished during the first fall after construction.

Upon completion of the project, roads no longer deemed necessary will be reclaimed. Reclamation will consist of recontouring to an acceptable degree (on major haul roads width may prohibit complete recontouring) scarification of compacted material to a depth of 18 inches on 3 feet centers to help water penetration, and reapplication of top soil to a minimum depth of 6 inches. Vegetation mixtures will consist of A1 and A2 as outlined above, using the same criteria. Reclaimed roads will be altered sufficiently to prohibit/discourage future vehicular traffic.

TOP SOIL

Top soil will be stockpiled on sites where both the application and subsequent removal can be accomplished with minimal impact on surrounding areas. Piles will be constructed to allow access to flat tops, with slopes not exceeding a 2:1 ratio. revegetation will be accomplished with annual and bi-annual plants. Protection from livestock grazing may be required. Under no grazing, annual and biennial vegetation should perpetuate itself under the environmental constraints of Roberts Mountain for 2-5 years. Under prolonged stockpiling, repeat seeding may be required.

Seeding will be accomplished as shortly after stockpiling is complete as possible. Seeding will be by broadcast, followed by a drag, allowing seed to be placed approximately 1/2 inch deep. Tractors, or other appropriate equipment may be used. Seeding rates will be 15 pounds per acre of the following mixture:

A3	Annual rye	67.0%
	Yellow sweet clover	33.0%
	total	100.0%

PITS

Upon completion, pits will be fenced or recontoured to minimize or eliminate public safety hazards and unnecessary hazards for animals. Cuts into the mountainside with rock will be left intact to enhance raptor nesting. Slopes will be left in a stable condition.

DUMPS

Revegetation of dump areas may be required to restore forage, cover and aesthetic values. Gradually a minimum of 6 inches of top soil will be uniformly redistributed over the site. (Note: For major activities such as the dumps, inadequate top soil may exist to meet recommendations. Mulch, or top soil reconstruction, utilizing portable rock crushing devices may be required to overcome this problem). Final reclamation soil will be sampled for nutrient analysis, with amendments applied as required.

Revegetation concepts for dumps will include mixture of hardy perennial bunch grasses, appropriate forbs and suitable browse species. Adaptation of tree or tree like species will normally be dependent upon secondary succession from surrounding sources. Trees of adapted species could be planted but the costs will be relatively high. Good establishment and survival of trees will require the purchase and outplanting of either bare root stock or container grown materials of several years of age. A possible new technique that might be explored is the use of polyacrylimides used with tree and shrub seeds to hold onto soil moisture and allow establishment. Otherwise supplemental irrigation and fertilizer may likely be required to assure success.

Broadcast seeding, utilizing appropriate equipment, will be emphasized. Seeding will be accomplished during the fall period of September 15 through November 30. Seed will be planted to a depth of 1/4 inch to 1/2 inch, but not exceeding 1/2 inch. Rates will be designed to apply 60 PLS/sq. ft. The mixture for seedable pit areas and dumps will be as follows:

A4	Ephraim crested wheat	15%
	Nordan crested wheat	15%
	Mountain brome	10%
	Idaho fescue	10%
	Small burnett	15%
	Ladak alfalfa	10%
	Cedar palmer penstemon	5%
	Bigsagebrush, vaseyana	10%
	Bitterbrush	10%
	total	100%

Dumps will be recontoured to enhance and blend into existing landscape, with special attention given to erosion control. After recontouring, top soil will be applied to a uniform depth of 6 inches, or alternative techniques, described above, will be considered.

MONITORING

The Gold Bar Resource Area reclamation project will likely cover a period of up to 10 years or longer, with reclamation being accomplished both early and late in the project life. Therefore, it is essential that a monitoring program be put into place initially so that long range plans may be modified if necessary, depending on initial results.

WEATHER STATION

Existing weather stations at the Gold Bar site will serve to supplement established weather stations in Austin, Eureka and elsewhere. Monitoring interpretations to judge the success of reclamation will require emphasis on daily precipitation with monthly and yearly data summarization. A minimum of 5 years of data will facilitate future reclamation planning.

RECLAMATION DEMONSTRATION PLOTS

To evaluate reclamation procedures, demonstration plots will be established at the Gold Bar Resource Area sites concurrent with mining activities. Data from these trials obtained early on in the mining plan will guide future reclamation and increase the chances of success. It would be logical to have a weather station at the same site. The site should be fenced. Top soil treatments will include the trials with several thicknesses of top soil (none, 3 and 6 inches) In addition, two soil treatments will be superimposed on the soil type, including (1) no mulch, and (2) mulch. Vegetation will include A4, and other mixtures deemed appropriate by the BLM.

REVEGETATION MONITORING

All sites with the exception of top soil, will be seeded between the dates of September 15 and November 30. Stand success will be monitored during the following summer, prior to July 15. Criteria will include a minimum of two healthy seedlings per square foot. Inadequate stand establishment normally dictates contingency seeding the following year with annuals and other undesirable species in order to assure that initial objectives will be attained.

WATERSHED CONSIDERATIONS

Any permanent road crossing a recognizable intermittent or permanent stream will require an adequate culvert (10 or 25 year storm). In order to accomplish this, the size of the watershed and its characteristics must be established or determined. Estimates of storm event intensity will have to be extrapolated from surrounding weather stations (primarily Eureka and Austin). All culverts will be removed or buried during reclamation and a surface drainage reestablished. Revegetation will be accomplished as previously outlined. Consideration must be given to all drainages whether intermittent or permanent streams.

Adequate vegetation from first year seeding will prevent most erosion on steep slopes of cuts and fills. However, to reduce erosion, impact water bars will be placed along the bottom of the fall at appropriate intervals.

PITS AND DUMPS

Runoff and sedimentation into tributaries to Roberts Creek are of concern. The area of the Gold Bar Satellite Mine area drains into the environmentally important Roberts Creek, and extra effort must be applied to reduce any erosion, either rill, interill or gully in this critical watershed area.

The entire impacted area within the Gold Bar Resource Area will be potentially influenced by a reduction in infiltration which can act to enhance runoff (the pits will not be free draining once the pits get started). The dumps themselves are usually course materials that may be only semi-compacted if at all. Often the dumps have much more surface area to wet before runoff can begin than do native soils. Pit tops may be strongly compacted and will require treatment to reduce runoff and erosion.

There is a concern that free runoff from the disturbed area can result as the water exits these soils. Increased flows in the drainage may result in increased erosion. Downslope sediment controls will consist of ponds, gravel traps, check dams and silt fences. This in itself may provide impact and require mitigation. Traps, berms or ditches will be required at the base of the dump to slow down runoff and let runoff waters sink into the ground.

CONTOURING

To aid in the reduction in runoff, dump slopes will be stabilized. Additionally, the objective is to bring the land back to a beneficial usefulness not only for watershed needs but to maintain visual resources as well.

Four Alternatives are Recognized:

1. NO ACTION: Although much less expensive, this alternative would lead to considerable impact. It is recognized that mining will occur. Without reclaiming, permanent and significant damage will occur throughout the overall area of the Gold Bar Resource Area sites and haul road with potential impact to Roberts Creek. This alternative is unacceptable.

2. THE PROPOSED ALTERNATIVE: This alternative represents the

most logical, practical and cost-effective mitigation.

3. THE PROPOSED ALTERNATIVE WITH EXTRA EFFORT GIVEN TO NATURALNESS: In this alternative, we would propose the seeding and use of indigenous plant materials only, including container grown trees for rapid reforestation of previously forested sites. This alternative would be more costly but of far more importance would be the fact that known sources of indigenous plant material are less successful in reclamation. The highest reclamation priority is to rapidly revegetate and stabilize disturbed surfaces especially in the light of the fragile ecology of Robert's Creek itself.

4. INCREASE THE SPEED OF NATURAL SUCCESSION: Although not completely feasible, there are ways to accelerate the process of natural secondary succession wherein species native to the disturbed sites will return to those sites with approximately the same species composition. These methods would include the use of container grown or bare rootstock of the dominant native species including trees, shrubs, grasses and forbs. An additional cost factor would be the use of supplemental irrigation to enhance establishment. This might include sprinkler or drip irrigation. In the case of irrigation, the systems are costly requiring a fairly slow reclamation process with the drip system or sprinkler system moved each year to several new unreclaimed acres. This alternative is cost prohibitive.

APPENDIX B: CULTURAL RESOURCES

TABLE 1: NON-IMPACTED SITES

Site No.	Site Type	Location	NRHP Status
ARS-492-1 BLM 6-1122	Lithic Scatter	Section 9 T 23 1/2N R 49E	Unevaluated
ARS 492-4 BLM 6-1122	Lithic Scatter	Section 36 T 24N R 49E	Unevaluated
ARS 492-5 BLM 6-1122	Lithic Scatter	Section 36 T 24N R 49E	Nonsignificant
ARS 557-9 BLM 6-1180(p)	Lithic Scatter	Section 3 T 23.5N R 49E	Non-significant
ARS 557-17 BLM 6-1180(p)	Lithic Scatter	Section 3 T 23.5N R 49E	Nonsignificant
ARS 557-15 BLM 6-1180(p)	Isolated Scatter	Section 2 T 23.5N R 49E	Non-significant
ARS 557-16 BLM 6-1180(p)	Lithic Scatter	Section 3 T 23.5N R 49E	Non-significant
ARS 557-19 BLM 6-1180(p)	Lithic Scatter	Section 3 T 23.5N R 49E	Non-significant
ARS 557-20 BLM 6-1180(p)	Rock Ring & Lithic Scatter	Section 2 T 23.5N R 49E	Non-significant

ARS 557-21 BLM 6-1180(p)	Isolated Artifact	Section 3 T 23.5N R 49E	Non-significant
ARS 564-1 BLM 6-1184(p)	Lithic Scatter	Section 27 T 22N R 50E	Non-significant
ARS 564-1 BLM 6-1184(p)	Isolated Point	Section 22 T 22N R 50E	Non-significant
26EU1428	Dugout	Section 8 T 22N R 50E	Significant
ARS 567-21	Isolated Biface	Section 2 T 22N R 50E	Non-significant
ARS 567-10 BLM 6-1191	Isolated Flake	Section 12 T 22N R 50E	Non-significant
ARS 567-11 BLM 6-1191	Small Lithic Scatter	Section 12 T 22N R 50E	Non-significant
ARS 567-12 BLM 6-1191	Lithic Scatter	Section 12 T 22N R 50E	Non-significant
ARS 567-13 BLM 6-1191	Lithic Scatter	Section 12 T 22N R 50E	Non-significant
ARS 567-14 BLM 6-1191	Lithic Scatter	Section 12 T 22N R 50E	Non-significant
ARS 567-15 BLM 6-1191	Lithic Scatter	Section 12 T 22N R 50E	Non-significant

CrNV-63-3691 BLM 6-742	Isolated Flake	Section 30 T 22N R 50E	Non-significant
CrNV-63-3692 BLM 6-742	Isolated Flake	Section 29 T 22N R 50E	Non-significant
CrNV-63-3693 BLM 6-742	Isolates (3) Flakes	Section 32 T 22N R 50E	Non-significant
CrNV-63-3694 BLM 6-742	Isolated Flake	Section 29 T 22N R 50E	Non-significant
CrNV-63-3695 BLM 6-742	Isolated Historic Wagon Part	Section 5 T 21N R 50E	Non-significant
CrNV-63-3800 BLM 6-759	Isolated Point	Section 26 T 22N R 49E	Non-significant
CrNV-63-3805 BLM 6-759	Isolated Points	Section 23 T 22N R 49E	Non-significant
CrNV-63-3808 BLM 6-759	Lithic Scatter	Section 23 T 22N R 49E	Significant
CrNV-63-3810 BLM 6-759	Isolated Biface	Section 22 T 22N R 49E	Significant
CrNV-63-3812 BLM 6-759	Isolated Flake	Section 27 T 22N R 49E	Significant
CrNV-63-3813 BLM 6-759	Isolated Flake	Section 28 T 22N R 49E	Significant

CrNV-06-1375 BLM 06-1141(p)	Lithic Scatter & Historic Site	Section 26* T 23N R 50E	Significant
CrNV-06-1376 BLM 06-1141(p)	Lithic Scatter	Section 33* T 23N R 50E	Non-significant
CrNV-06-1377/ 1378 BLM 06-1141(p)	Lithic Scatter & Rock Shelters	Section 34* T 23N R 50E	Significant
RRA-88-116-2 BLM 06-1141(p)	Charcoal Oven	Section 35* T 23N R 50E	Non-significant
RRA-88-116-3 BLM 06-1141(p)	Cave Site	Section 35* T 23N R 50E	Significant
RRA-88-116-4 BLM 06-1141(p)	Mining Adit	Section 35* T 23N R 50E	Unevaluated
RRA-88-116-5 BLM 06-1141(p)	Lithic Scatter	Section 35* T 23N R 50E	Non-significant
RRA-88-116-8 BLM 06-1141(p)	Isolated Flake	Section 35* T 23N R 50E	Non-significant
RRA-88-116-9 BLM 06-1141(p)	Lithic Scatter	Section 35* T 23N R 50E	Significant
RRA-88-116-10 BLM 06-1141(p)	Lithic Scatter	Section 27* T 23N R 50E	Significant
RRA-88-116-11 BLM 06-1141(p)	Lithic Scatter With Tools	Section 26* T 23N R 50E	Significant

RRA-88-116-12 BLM 06-1141(p)	Isolated Flake	Section 27* T 23N R 50E	Non-significant
RRA-88-116-13 BLM 06-1141(p)	Lithic Scatter	Section 27* T 23N R 50E	Non-significant
RRA-88-116-14 BLM 06-1141(p)	Point & Flake	Section 28* T 23N R 50E	Non-significant
RRA-88-116-15 BLM 06-1141(p)	Isolated Flake	Section 28* T 23N R 50E	Non-significant
RRA-88-116-16 BLM 06-1141(p)	Lithic Scatter	Section 27* T 23N R 50E	Non-significant
RRA-88-116-17 BLM 06-1141(p)	Lithic Scatter	Section 35* T 23N R 50E	Significant
RRA-88-116-18 BLM 06-1141(p)	Rock Shelter	Section 27* T 23N R 50E	Non-significant
RRA-88-116-19 BLM 06-1141(p)	Isolated Point	Section 28* T 23N R 50E	Non-significant
RRA-88-116-20 BLM 06-1141(p)	Lithic Scatter	Section 27* T 23N R 50E	Non-significant
RRA-88-116-21 BLM 06-1141(p)	Lithic Scatter	Section 35* T 23N R 50E	Significant
RRA-88-116-22 BLM 06-1141(p)	Lithic Scatter	Section 35* T 23N R 50E	Significant

BLM 6-401		unknown **	
IMR 396-SS16 BLM 6-401	Isolated Biface	Location unknown **	Non-significant
IMR 396-SS17 BLM 6-401	Isolated Flake	Location unknown **	Non-significant
IMR 396-SS18 BLM 6-401	Lithic Scatter	Location unknown **	Non-significant
IMR 396-SS19 BLM 6-401	Isolated Flake	Location unknown **	Non-significant
IMR 396-SS20 BLM 6-401	Lithic Scatter	Location unknown **	Non-significant
ERTEC NW INC BLM 6-352(p) CrNV-63-2680	Lithic Biface	T 21N R50E/R51E	Non-significant
ERTEC NW INC BLM 6-352(p) CrNV-63-2681	Isolated Flake	T 21N R50E/R51E	Non-significant
ERTEC NW INC BLM 6-352(p) CrNV-63-2682	Chert Quarry	T 21N R50E/R51E	Significant
ERTEC NW INC BLM 6-352(p) CrNV-63-2683	Isolated Flake	T 21N R50E/R51E	Non-significant
ERTEC NW INC BLM 6-352(p) CrNV-63-2684	Isolated Flake	T 21N R50E/R51E	Non-significant
ERTEC NW INC BLM 6-352(p) CrNV-63-2685	Isolated Point	T 21N R50E/R51E	Non-significant
ERTEC NW INC BLM 6-352(p) CrNV-63-2686	Lithic Scatter	T 21N R50E/R51E	Non-significant

ERTEC NW INC BLM 6-352(p) CrNV-63-2687	Isolated Flake	T 21N R50E/R51E	Non-significant
ERTEC NW INC BLM 6-352(p) CrNV-63-2688	Lithic Scatter	T 21N R50E/R51E	Significant

TABLE 2: POSSIBLE IMPACTED SITES

ARS 492-2 BLM 6-1122	Lithic Scatter	Section 9 T 23N R 49E	Significant
ARS 492-3 BLM 6-1122	Lithic Scatter	Sec. 5,8 & 9 T 23N R 49E	Non-significant
ARS 557-1 BLM 6-1180(p)	Lithic Scatter	Section 1 T 23.5N R 49E	Non-significant
ARS 557-2 BLM 6-1180(p)	Lithic Scatter	Section 2 T 23.5N R 49E	Non-significant
ARS 557-3 BLM 6-1180(p)	Lithic Scatter	Section 2 T 23.5N R 49E	Non-significant
ARS 557-4 BLM 6-1180(p)	Lithic Scatter	Section 2 T 23.5N R 49E	Non-significant
ARS 557-5 BLM 6-1180(p)	Lithic Scatter	Section 2 T 23.5N R 49E	Non-significant
ARS 557-6 BLM 6-1180(p)	Lithic Scatter	Section 2 T 23.5N R 49E	Non-significant
ARS 557-7 BLM 6-1180(p)	Lithic Scatter	Section 2 T 23.5N R 49E	Non-significant
ARS 557-8 BLM 6-1180(p)	Lithic Scatter	Section 2 T 23.5N R 49E	Non-significant
ARS 557-10	Lithic Scatter	Section 2	Non-significant

BLM 6-1180(p)		T 23.5N R 49E	
ARS 557-11 BLM 6-1180(p)	Lithic Scatter	Section 2 T 23.5N R 49 E	Non-significant
ARS 557-12 BLM 6-1180(p)	Lithic Scatter	Section 3 T 23.5N R 49E	Non-significant
ARS 557-13 BLM 6-1180(p)	Isolated Flake	Section 3 T 23.5N R 49E	Non-significant
ARS 557-18 BLM 6-1180(p)	Lithic Scatter	Section 2 T 23.5N R 49E	Non-significant
CNv-63-3833 BLM 6-1180(p)	Historic Telephone Line	Section 34 T 23N R 49E Section 2 T 23.5N R 49E	Significant
RRA-87-92-1 BLM 6-1108(p)	Historic Dump	Section 3 T 22N R 50E	Non-significant
ARS 567-1 BLM 6-1191	Charcoal Complex	Section 1 T 22N R 50E	Significant
ARS 567-2 BLM 6-1191	Historic Artifacts	Section 1 T 22N R 50E	Non-significant
ARS 567-3 BLM 6-1191	Lithic Scatter	Section 1 T 22N R 50E	Non-significant
ARS 567-4 BLM 6-1191	Lithic Scatter	Section 1 T 22N	Non-significant

		R 50E	
ARS 567-5 BLM 6-1191	Prehistoric Camp and Lithic Scatter	Section 1 T 22N R 50E	Significant
ARS 567-6 BLM 6-1191	5 Charcoal Pits	Section 1 T 22N R 50E	Significant
ARS 567-7 BLM 6-1191	Historic Trash Scatter	Section 1 T 22N R 50E	Non-significant
ARS 567-8 BLM 6-1191	Logging Road	Section 1 T 22N R 50E	Non-significant
ARS 567-9 BLM 6-1191	Charcoal Complex and Road	Section 1 T 22N R 50E	Significant
ARS 567-16 BLM 6-1191	Isolated Biface	Section 10 T 22N R 50E	Non-significant
ARS 567-17 BLM 6-1191	Lithic Scatter	Section 10 T 22N R 50E	Non-significant
ARS TS-1	Lithic Scatter	Section 3 T 23.5N R 49E	Unevaluated
ARS TS-2	Isolated Point	Section 3 T 23.5N R 49E	Unevaluated
ARS TS-3	Isolated Point	Section 4 T 23.5N R 49E	Unevaluated
CrNV-63-3801 BLM 6-759	Lithic Scatter	Section 26 T 22N	Significant

		R 49E	
CrNV-63-3802 BLM 6-759	Isolated Projectile Points (2)	Section 26 T 22N R 49E	Non-significant
CrNV-63-3803 BLM 6-759	Isolated Point	Section 26 T 22N R 49E	Non-significant
CrNV-63-3804 BLM 6-759	Isolated Projectile Points (2)	Section 23 T 22N R 49E	Non-significant
CrNV-63-3811 BLM 6-759	Isolated Flake	Section 27 T 22N R 49E	Significant
ARS 345-1	Lithic Scatter	Section 34 T 24N R 49E	Significant
ARS 345-2	Isolated Flake	Section 34 T 24N R 49E	Non-significant
ARS 345-3	Isolated Flake	Section 34 T 24N R 49E	Non-significant
ARS-388-1	Lithic Scatter	Section 3 T 24N R 49E	Non-significant
ARS-388-2	Isolated Point	Section 3 T 23.5N R 49E	Non-significant
ARS-388-3	Isolated Flake	Section 4 T 23.5N R 49E	Non-significant
ARS-406/	Isolated Biface	Section 33	Non-significant

33-6-2		T 24N R 49E	
ARS-406/ 33-5-3	Isolated Flake	Section 33 T 24N R 49E	Non-significant
ARS-406/ 33-5-4	Isolated Flake	Section 33 T 24N R 49E	Non-significant
ARS-406/ 33-13-5	Isolated Flake	Section 33 T 24N R 49E	Non-significant
ARS-406/ 33-15-6	Projectile Point & Flake	Section 33 T 24N R 49E	Non-significant
ARS-406/ 33-22-7	Isolated Biface	Section 33 T 24N R 49E	Non-significant
ARS-406/ 33-25-9	Isolated Biface	Section 33 T 24N R 49E	Non-significant
ARS-406/ 33-24-10	One Core & One Flake	Section 33 T 24N R 49E	Non-significant
ARS-406/ 33-26-11	Lithic Scatter	Section 33 T 24N R 49E	Non-significant
ARS-406/ 33-27-16	Five Flakes	Section 33 T 24N R 49E	Non-significant
ARS-406/ 33-28-17	Isolated Flake	Section 33 T 24N R 49E	Non-significant

ARS-406/ 33-29-20	Lithic Scatter	Section 33 T 24N R 49E	Non-significant
ARS-406/ 33-32-21	Isolated Flake	Section 33 T 24N R 49E	Non-significant
ARS-406/ 33-32-22	1 Biface & 2 Flakes	Section 33 T 24N R 49E	Non-significant
ARS-406/ 33-34-23	Isolated Flake	Section 33 T 24N R 49E	Non-significant
ARS-406/ 33-32-24	Isolate Biface	Section 33 T 24N R 49E	Non-significant
ARS-406/ 33-32-25	Lithic Scatter	Section 33 T 24N R 49E	Non-significant
ARS-406/ 33-33-26	3 Flakes	Section 33 T 24N R 49E	Non-significant
ARS-406/ 33-36-28	Isolated Flake	Section 33 T 24N R 49E	Non-significant
ARS-406/ 33-36-29	3 Flakes	Section 33 T 24N R 49E	Non-significant
ARS-406/ 33-36-30	2 Flakes	Section 33 T 24N R 49E	Non-significant
ARS-406/ 33-36-31	Lithic Scatter	Section 33 T 24N R 49E	Non-significant

ARS-406/ 33-37-32	Lithic Scatter	Section 33 T 24N R 49E	Non-significant
ARS-406/ 33-38-33	1 Point & 1 Flake	Section 33 T 24N R 49E	Non-significant
ARS-406/ 33-38-34	Isolated Biface	Section 33 T 24N R 49E	Non-significant
ARS-406/ 33-38-35	Lithic Scatter	Section 33 T 24N R 49E	Non-significant
ARS-406/ 33-37-36	Isolated Flake	Section 33 T 24N R 49E	Non-significant
ARS-406/ 33-38-37	Isolate-unknown	Section 33 T 24N R 49E	Non-significant
ARS-388-1	Lithic Scatter	Section 33 T 24N R 49E	Non-significant
ARS-388-9	Telephone Line	Section 3, 23, & 24 T 24N R 49E	Significant

TABLE 3: SITES TO BE IMPACTED

26EU1423	8 Charcoal Ovens and Habitation Sites	Section 9 T 22N R 50E	Significant
26EU1424	45 Charcoal ovens and 8 habitation Sites	Section 2,11 T 22N R 50E	Significant
26EU1427	20 Charcoal Ovens and a Habitation Site	Section 11 T 22N R 50E	Significant
ARS 567-22	Lithic Scatter	Section 11 T 22N R 50E	Non-significant

TABLE 4: IMPACTED SITES

ARS 540-1 BLM 6-1168(p)	Lithic Scatter	Section 30 T 22N R 50E	Non-significant
ARS 540-2 BLM 6-1168(p)	Historic Camp	Section 29 T 22N R 50E	Non-significant
ARS 540-3 BLM 6-1168(p)	Isolated Biface	Section 29 T 22N R 50E	Non-significant
ARS 540-4 BLM 6-1168(p)	Charcoal Platform	Section 29 T 22N R 50E	Non-significant
ARS 540-5 BLM 6-1168(p)	Charcoal Platform	Section 28 T 22N R 50E	Non-significant
ARS 540-6 BLM 6-1168(p)	Historic Millstone and Tin Can	Section 22 T 22N R 50E	Non-significant
CrNv-06-2097 BLM 6-1168(p)	Lithic Scatter and Historic Trash	Section 13&24 T 22N R 50E	Non-significant
ARS TS-4	Isolated Biface	Section 3 T 23.5N R 49E	Unevaluated
ARS TS-5	Historic Telephone Line	Section 3 T 23.5N R 49E	Unevaluated
ARS TS-6	Historic Tin Can	Section 3 T 23.5N R 49E	Unevaluated
ARS TS-7	Prehistoric Camp	Section 3	Unevaluated

	and Lithic Scatter	T 23.5N R 49E	
ARS TS-8	Prehistoric and Historic Site	Section 3 T 23.5N R 49E	Unevaluated
CrNV-63-3806 BLM 6-759	Isolated Projectile Points	Section 26 T 22N R 49E	Non-significant
CrNV-63-3807 BLM 6-759	Lithic Scatter	Section 23 T 22N R 49E	Significant
CRNV-63-3809 BLM 6-759	Isolated Tool	Section 26 T 22N R 49E	Significant
RRA-88-116-1 BLM 06-1141(p)	Lithic Scatter	Section 10* T 23N R 50E	Non-significant
RRA-88-116-25 BLM 06-1141(p)	Historic Tin Can	Section 14* T 22N R 50E	Non-significant
RRA-88-116-26 BLM 06-1141(p)	Lithic Scatter	Section 14* T 22N R 50E	Non-significant
RRA-88-116-27 BLM 06-1141(p)	Coal Production	Section 3* T 22N R 50E	Significant
RRA-88-116-28 BLM 06-1141(p)	Coal Production	Section 10* T 22N R 50E	Significant
RRA-88-116-29 BLM 06-1141(p)	Charcoal Oven	Section 3* T 22N R 50E	Unevaluated
RRA-88-116-31	Charcoal Production	Section 4*	Unevaluated

BLM 06-1141(p)		T 22N R 50E	
RRA-88-116-33 BLM 06-1141(p)	Charcoal Ovens	Section 15* T 22N R 50E	Unevaluated
RRA-88-116-35 BLM 06-1141(p)	Charcoal Production	Section 14* T 22N R 50E	Unevaluated
RRA-88-116-36 BLM 06-1141(p)	Charcoal Production	Section 34* T 23N R 50E	Non-significant
RRA-88-116-37 BLM 06-1141(p)	Charcoal Production	Section 9* T 22N R 50E	Unevaluated
RRA-88-116-38 BLM 06-1141(p)	Can Scatter	Section 14* T 22N R 50E	Non-significant
RRA-88-126-11 BLM 06-1141(p)	Lithic Scatter & Quarry	Section 2* T 22N R 50E	Unevaluated
RRA-88-126-12 BLM 06-1141(p)	Charcoal Production & Habitation Complex	Section 11* T 22N R 50E	Unevaluated
RRA-88-126-17 BLM 06-1141(p)	Charcoal Ovens & Structural Debris	Section 10* T 22N R 50E	Unevaluated
ARS-345-4	Lithic Scatter	Section 34 T 24N R 49E	Significant
ARS-345-5	Lithic Scatter	Section 2 T 23.5N R 49E	Significant

ARS-345-6	Isolated Artifact	Section 2 T 23.5N R 49E	Non-significant
ARS-345-7	Lithic Scatter	Section 34 T 24N R 49E	Significant
ARS-345-8	Isolated Flake	Section 2 T 23.5N R 49E	Non-significant
ARS-345-9	Historic Telephone Line	Section 34 T 24N R 49E	Significant
ARS 345-10	Isolated Flake	Section 3 T 23.5N R 49E	Non-significant
ARS-345-11	Isolated Point	Section 33 T 24N R 49E	Non-significant
ARS-345-12	Isolated Point	Section 33 T 24N R 49E	Non-significant
ARS -345-13	Isolated Flake	Section 22 T 23.5N R 49E	Non-significant
ARS-345-14	Isolated Flake	Section 2 T 23.5N R 49E	Non-significant
ARS-345-16	Isolated Flake	Section 2 T 23.5N R 49E	Non-significant
ARS-352 26EU1267	Lithic Scatter	Section 2 T 23.5N R 49E	Significant

ARS-388-4	Isolated Artifact	Section 3 T 23.5N R 49E	Non-significant
ARS-388-5	Telephone Poles	Section 3 T 23.5N R 49E	Non-significant
ARS-388-6	Isolated Tin Can	Section 3 T 23.5N R 49E	Non-significant
ARS-388-7	Flakes, Tools & Metate Fragment	Section 3 T 23.5N R 49E	Non-significant
ARS-388-8	Biface & 2 Tin Cans	Section 3 T 23.5N R 49E	Non-significant
ARS-406/ 33-25-13	Isolated Flakes & Quarry	Section 33 T 24N R 49E	Non-significant
ARS-406/ 33-26-14	Isolated Flake	Section 33 T 24N R 49E	Non-significant
ARS-406/ 33-26-12	Isolated Lithic	Section 33 T 24N R 49E	Non-significant
ARS-406/ 33-26-8	Lithic Scatter	Section 33 T 24N R 49E	Non-significant
ARS-406/ 33-29-19	Lithic Scatter & Quarry	Section 33 T 24N R 49E	Non-significant
ARS-406/ 33-27-18	Isolated Biface	Section 33 T 24N R 49E	Non-significant

ARS-406/ 33-32-27	Lithic Scatter Ground Stone	Section 33 T 24N R 49E	Significant
FWJ 109-1 BLM 6-941 CrNV-63-4619	Lithic Scatter	Section 28 T 24N R 49E	Non-significant
FWJ 109-2 BLM 6-941 CrNV-63-4620	Lithic Scatter	Section 28 T 24N R 49E	Non-significant
FWJ 109-3 BLM 6-941 CrNV-63-4620	Lithic Scatter	Section 28 T 24N R 49E	Non-significant
FWJ 109-4 BLM 6-941 CrNV-63-4619	Lithic Scatter	Section 28 T 24N R 49E	Non-significant
FWJ 109-5 BLM 6-941 CrNV-63-4619	Lithic Scatter	Section 28 T 24N R 49E	Non-significant
FWJ 109-6 BLM 6-941 CrNV-63-4620	Lithic Scatter	Section 28 T 24N R 49E	Non-significant
FWJ 109-7 BLM 6-941 CrNV-63-4620	Lithic Scatter	Section 21 T 24N R 49E	Non-significant
FWJ 109-8 BLM 6-941 CrNV-63-4619	Lithic Scatter	Section 28 T 24N R 49E	Non-significant
FWJ 109-9 BLM 6-941 CrNV-63-4620	Lithic Scatter	Section 21 T 24N R 49E	Non-significant
FWJ 109-10 BLM 6-941 CrNV-63-4621	Lithic Scatter	Section 21 T 24N R 49E	Non-significant

FWJ 109-11 BLM 6-941 CrNV-63-4620	Lithic Scatter	Section 21 T 24N R 49E	Non-significant
FWJ 109-12 BLM 6-941 CrNV-63-4620	Lithic Scatter	Section 21 T 24N R 49E	Non-significant
FWJ 109-13 BLM 6-941 CrNV-63-4620	Lithic Scatter	Section 21 T 24N R 49E	Non-significant
FWJ 109-14 BLM 6-941 CrNV-63-4620	Lithic Scatter	Section 28 T 24N R 49E	Non-significant
FWJ 109-15 BLM 6-941 CrNV-63-4620	Isolated Biface	Section 28 T 24N R 49E	Non-significant
FWJ 109-16 BLM 6-941 CrNV-63-4619	Isolated Flake	Section 28 T 24N R 49E	Non-significant
FWJ 109-17 BLM 6-941 CrNV-63-4619	Lithic Scatter	Section 27 T 24N R 49E	Non-significant
FWJ 109-18 BLM 6-941 CrNV-63-4619	Lithic Scatter	Section 27 T 24N R 49E	Non-significant
FWJ 109-19 BLM 6-941 CrNV-63-4619	Lithic Scatter	Section 27 T 24N R 49E	Non-significant
FWJ 109-20 BLM 6-941 CrNV-63-4619	Lithic Scatter	Section 27 T 24N R 49E	Non-significant
FWJ 109-21 BLM 6-941 CrNV-63-4619	Isolated Flake	Section 27 T 24N R 49E	Non-significant

TABLE 5: SITES WITH UNCERTAIN LOCATION

CrNV-63-5134 BLM 6-1169(p)	Isolated Point	T22N/T23N R 50E	Non-significant
CrNV-63-5135 BLM 6-1169(p)	Lithic Scatter	T22N/T23N R 50E	Non-significant
CrNV-63-5136 BLM 6-1169(p)	Lithic Scatter	T22N/T23N R 50E	Non-significant
CrNV-63-5137 BLM 6-1169(p)	Lithic Scatter	T22N/T23N R 50E	Non-significant
CrNV-63-5138 BLM 6-1169(p)	Isolated Flake	T22N/T23N R 50E	Non-significant
CrNV-63-5139 BLM 6-1169(p)	Lithic Scatter	T22N/T23N R 50E	Non-significant
CrNV-63-5140 BLM 6-1169(p)	Lithic Scatter	T22N/T23N R 50E	Non-significant
CrNV-63-5141 BLM 6-1169(p)	Lithic Scatter	T22N/T23N R 50E	Non-significant
CrNV-63-5142 BLM 6-1169(p)	Lithic Scatter	T22N/T23N R 50E	Non-significant

APPENDIX C: SOCIOECONOMICS FOR ELKO\CARLIN AND BATTLE MOUNTAIN REGIONS

ELKO

EDUCATION

One of the areas affected by the tax situation is education. School district records show that 37% of the parents with children attending Elko County schools work in Eureka County. The growth in population associated with the growth in mining operations and related businesses has resulted in a dramatic increase in the student population within the Elko County School District. A major problem facing the district has been the ability to respond with capital funding for needed physical improvements and expansion.

A "Pay-As-You-Go" Election was held on March 28, 1989 to determine if the current Pay-As-You-Go should be increased from 25 cents to the legal limit of 50 cents per $100 assessed valuation to finance school capital projects. Passage of the proposal would expand and extend the current Pay-As-You-Go for 10 years. (Pay-As-You-Go is a method of financing school capital projects on an as-needed basis by an increase in the property tax for a period of time and rate as decided by the registered electorate.) The proposal passed by a margin of 71.3% to 28.7%.

From October 1987 to October 1988, 830 new students enrolled in Elko County schools. Students were of all grade levels, and joined classes throughout the school year. This represents an overall growth of 16% over the past school year. Growth over the past five years has been 64% and the school district is projecting the same level of growth over the next five years (personal communication, Paul Billings).

In order to keep up with the increase in student population the school district has made use of mobile classrooms. At present 39 classrooms are located in mobile units and it is expected that 14 more mobile units will be needed for the next school year (personal communication, Paul Billings). Sixteen school buses have been purchased over the past three years, and four additional buses will be needed yearly over the next five years to keep pace with projected growth.

TABLE 6: CAPACITY AND CURRENT ENROLLMENT OF ELKO AND CARLIN AREA SCHOOLS

School	Capacity	Enrollment*
Carlin	470	470
Elko High School	1,300	1,041
Elko Junior High	575	601
Elko Grammar School No. 2	400	466
Mountain View Elementary	375	394
Northside School	550	477
Southside School	625	670
Spring Creek	670	721

*Figures obtained from an interview with Elko County School Superintendent 3/22/89.

If current projections are correct, the district foresees the need for four additional elementary schools, one Junior High School, and an expansion to the High School within the next six years.

The growth in student population has increased the need for specialized education services. For example, services for blind, deaf, and multiple handicapped students are required. As the school district grows it is not unusual that the need for specialized services to increase. As of spring 1989 the student/teacher ratio was 30:1, compared to a state and national average of 24.9:1 and 17.6:1 respectively. To lower class size to 25 students would immediately require 18 additional classrooms in the Elko/Spring Creek area.

There will also be a need for four additional buses yearly over the next five years to keep pace with projected growth.

Vocational facilities in Elko High School were designed for a student body of approximately 800. Shop, home economics, art, and computer facilities are expected to be inadequate next year.

To date it has not been a problem finding qualified applicants to fill faculty positions. There have been times in the past, however, when applicants were dissuaded from accepting a position due to a housing shortage.

HOUSING

The housing shortage in the Elko and Carlin areas created by the dramatic population increase is being addressed with a number of housing projects including single family residences, a condominium complex, and several large mobile home parks. As a consequence, with the addition of families, the price of housing has escalated.

Mountain View Estates, a construction project by Ivory Homes, will add 223 homes to the Elko area through a three phase development plan. Ivory Homes will also develop a subdivision called North Hollow, featuring smaller, lower-priced homes. This will add an additional 97 homes to the Elko housing market. Various other developers are involved in the construction or planning phases of new housing.

EMPLOYMENT

Unemployment in Elko County is approximately 5.2% (March 1989 figure). This rate has been fairly consistent over the past year. Approximately 100 new applicants are processed on a daily basis at the Elko Employment Security Office. Mining related jobs are available for nearly all those qualified within two months of application (personal communication, Dennis Lattin). Therefore, much of the unemployment rate is attributed to "unemployable" people without qualifications to meet job requirements or those people between jobs. The job market in the Elko-Carlin area could be considered to be heavily dependent upon mining.

One segment of the mining-related work force is contract employment. Many construction workers are attracted to the area due to significant job opportunities associated with start-up and expansion of mine facilities. Between jobs most of the workers stay in the area in temporary housing (e.g. RVs and camping) often placing a significant burden on social service agencies before another job becomes available.

Influenced by the influx of new workers and their families to the area, as many as 500 jobs in the $4-$6/hr. range are currently available in the services sector. However, the price of housing in the area makes it virtually impossible to support oneself on wages paid in this sector.

WELFARE

The number of new cases in the Elko County Welfare

Department increased by 60% between 1987 and 1988, from 107 to 172 respectively. 56 new cases were reported in the first two months of 1989 consuming 96% of the 88-89 budget (personal communication, Sandra Worthington). Many of the cases are related to persons coming to the area seeking mining jobs. Those unable to find jobs often require assistance. In some cases those who are hired need support until they receive their first paycheck or require medical assistance until they qualify for medical insurance.

HEALTH CARE

Hospital and medical services in the City of Elko are being impacted by the population growth in the county and surrounding area. Elko General Hospital provides services for an area encompassing up to 40,000 people. The 50 bed facility has staff and diagnostic equipment to provide medical services in the areas of anesthesia, ENT, family practice, general surgery, internal medicine, ob/gyn, ophthalmology, orthopedics, pathology, radiology, and urology.

In the past two years the number of obstetric and pediatric cases has doubled, emergency room calls have increased four-fold, the number of surgeries has gone up 50%, and outpatient visits have gone up by 50-100% (personal communication, Bill Welch).

At present the hospital experiences 53-57% occupancy (personal communication, Bill Welch). The obstetrics unit is frequently at 100% capacity and the medical/surgical unit at 80-90% capacity. The pediatric unit is rarely filled due to a limited pediatric staff to handle the cases. The intensive care unit varies in occupancy. There is very heavy use of emergency room facilities necessitating utilization of all available physicians to provide services. This situation makes it difficult to make a private appointment with a physician since nearly all their time is required at the hospital. The waiting time for a private appointment is typically two weeks which actually contributes to heavier use of the emergency room by patients unwilling or unable to wait for a private appointment.

In order to meet the needs of the growing population and provide comprehensive medical services, the hospital is continuously recruiting physicians, registered nurses (particularly those with specialty training), and technicians. A recruitment committee sends representatives to medical conferences and contacts physicians completing their residency regarding opportunities at Elko General Hospital. Physical changes have also been necessary to provide expanded outpatient services, diagnostic equipment, and administrative space.

The next required phase of renovation would include expanding the surgery suites, doubling the number of recovery beds, and renovating the obstetrics unit. This renovation would require an estimated $600,000. Hospital administration made an appeal to mining industry to provide half of the funding required; $105,000 was contributed by the industry (personal communication, Bill Welch).

The lack of medical facilities in Carlin has not been a serious problem as there is a volunteer ambulance service to transport patients to Elko. The ambulance corp currently has 20 volunteers and operates two ambulances. A new ambulance will be acquired this year at which time the oldest vehicle will be used for transport of equipment. The Carlin Ambulance Corp is the primary responder to the mine sites located in the narrow band of Eureka County separating Elko and Lander counties. In fact, one-third of their calls are in Eureka County. Barrick and other mining companies maintain emergency medical capability at their operations.

LAW ENFORCEMENT

Police: The Police Department of the City of Elko has a staff comprised of 26 officers and 10 dispatchers and clerks. Three new staff members were hired in 1988, the first increase in five years, with the assistance of a $100,000 grant from the mining companies. The department anticipates adding two more officers in July.

Additions of staff to the Department have been necessary to keep pace with the increased case load. In 1988 the number of cases increased by the following percentages from the previous year:

Traffic Accidents	61%
Public Service Calls	43%
Reported Misdemeanors	31%
Reported Felonies	23%
Arrests	34%

Source: personal communication, Bob Kirby, Assist. Police Chief

The Police Department has 12 vehicles at its disposal at this time. Response time within the city limits is 3 to 5 minutes.

The Police Department in the City of Carlin is comprised of the chief of police, four full-time officers, and a part-time secretary. One officer and one equipped vehicle were added last year, and the department is expecting to add another officer in July 1989. From 1987 to 1988 the number of calls answered by the Carlin Police Department nearly doubled. The rate slowed somewhat over the winter months of 1989. It is believed that additional housing in the area, alleviating overcrowded conditions, has helped the situation (personal communication, Marylou Tognarelli).

Jail facilities for the Elko and Carlin Police Departments are provided by the Elko County Sheriff's Department, located in the City of Elko, through a cooperative agreement. The Elko County Sheriff's Department currently has 23 officers and 14 jail staff. Two members were added to the jail staff one year ago and there is a request in the current budget for five new officers.

Bookings have increased over the past few years from 1,731 in 1983 to 2,945 in 1988. Increases have been noted particularly in DUI, domestic violence, and burglaries of both vehicles and residences especially in the Elko area. There has also been an increase in destruction of private property and vandalism (personal communication, Neil Harris).

The capacity of the present jail facility, in use since July 1987, is 101 beds. It is the only jail in the County. Through an agreement with the City of Elko, all city prisoners are booked at no charge in exchange for the land where the jail is located. The average daily inmate population for 1988 was 47, up from an average of 27 five years ago.

As the size of the department staff and the limits of the city expand, the purchase of additional vehicles will become necessary. Two members were added to the jail staff one year ago and there is a request in the current budget for five new officers.

FIRE DEPARTMENT

The Elko Fire Department is comprised of 14 full-time personnel, including the chief, assistant fire marshall, and 20 volunteers. Fire fighting equipment includes three structural fire fighting trucks, one platform truck, several pumpers, "jaws of life", and breathing apparatus. The department's area of responsibility is approximately 15 square miles. Response time is two to three minutes in the city and approximately five minutes in the outlying areas. The number of fire calls has increased over the past few years from 435 fire and EMS calls in 1984 to 716 calls in 1988.

The Carlin Fire Department currently has 26 volunteers and 4 openings. A request has been made in the current budget for one fire prevention officer and three firemen. The department has mutual aid agreements with the U.S. Forest Service and the BLM.

UTILITIES

Water source for the City of Elko is from deep water wells and is in good supply. With the assistance of contributions from Barrick and other mining companies, Elko is completing drilling of additional water wells and the construction of two water storage tanks and a pipeline distribution system to provide 5 million additional gallons of storage and distribution.

The sewage treatment plant is currently at permit capacity and a two phase expansion is planned. Phase I, planned for this summer, would increase capacity from 2.5 to 3.3 million gallons per day (gpd). The cost of the project is estimated at $2.2 million to come from the city water and sewer fund, aided by a contributions of approximately $600,000 from mining companies. Sewer connection fees have been raised to help pay for this and future expansions. Phase II of the project would further increase capacity to 3.5 million gpd and is tentatively planned for the summer of 1990.

The above mentioned water and waste water treatment improvements in the City of Elko would be adequate to serve a population of approximately 27,000 (personal communication, Ferron Konakis).

Carlin is improving its domestic water supply by drilling a new well and upgrading the water distribution system. The new well, providing an additional 1,000 gpm, is expected to be in use by July 1989. When the expansion is complete, the city water system will be able to serve a population of 3,500. The city is midway through a project to upgrade the sewage treatment system funded by a federal grant through the EPA. The upgraded system will be able to accommodate 3,500 people. Room is available for future expansion of this system if necessary.

BATTLE MOUNTAIN

EMPLOYMENT

Employment in Lander County continues to be heavily dependant upon the mining industry. Table 7 reflects non-agricultural employment by place of work in Lander County according to official 1988 state figures.

TABLE 7: LANDER COUNTY ESTABLISHMENT BASED INDUSTRIAL EMPLOYMENT

Category	Distribution (%) 1988
Mining	47.8
Construction	8.2
Manufacturing	0.4
Transportation & Public Utilities	3.7
Trade	10.2
Finance, Insurance & Real Estate	1.2
Services	12.2
Government	16.7

Note: Figures may not add to 100% due to rounding.
Source: Nevada Employment Security Department, Research Section

Unemployment rates typically show some seasonal fluctuation, with rates lower in the warmer months due to increased ranching employment and jobs related to tourism. Unemployment rates have stabilized over the years since the barite industry failed (personal communication, Jack Fenkell). Table 8 shows annual employment figures for Lander County prior to the barite boom through the present.

TABLE 8: SIZE OF THE LABOR FORCE, NUMBER OF PEOPLE UNEMPLOYED, AND THE UNEMPLOYMENT RATE FOR LANDER COUNTY, 1975 TO PRESENT

Year	Labor Force	Unemployed Rate	Unemployment
75	1,560	60	3.6%
76	1,570	70	4.1%
77	1,570	80	5.1%
78	1,680	30	1.9%
79	1,990	80	3.8%
80	2,340	90	3.9%
81	2,630	110	4.0%
82	2,530	240	9.5%
83	2,300	280	12.2%
84	2,110	160	7.4%
85	2,170	180	8.1%
86	2,090	200	9.4%
87	2,310	140	6.3%
88	2,820	140	5.0%

Source: Nevada Department of Employment Security Research

HOUSING

At the height of the barite mining boom in 1979, Battle Mountain expanded its water and sewer facilities to accommodate a significant increase in population. Unfortunately the barite industry collapsed in 1981, leaving the town to bear the cost of the expansion without the growth to support it as expected. This situation, however, has allowed the town to meet the water and sewer needs of mining-related growth since that time. Both the water and sewage treatment facilities were designed to accommodate an equivalent population of 8,000 (this includes people staying in motels and RV parks). The sewage treatment facility infiltration system was not fully completed and it is presently at capacity. A study was undertaken to examine the needs of the water delivery system as it relates to present growth patterns in Battle Mountain. Recommendations were recently submitted to the county commissioners for consideration.

The housing situation in Battle Mountain is very near capacity. There are a number of houses listed for sale with local realtors, but most newcomers are looking for temporary housing and are not interested in these listings. Virtually all new development can be attributed to mobile homes. At present it is difficult, if not impossible, to find a space available for a mobile home unit. Although a moratorium on further development has not been declared, a low water pressure situation in the southwest area of Battle Mountain and limited sewage treatment capacity places constraints on future development.

While land does exist for future development, investors seem reluctant to make long term commitments in an area that is primarily dependent on the mining industry.

EDUCATION

The Lander County School District includes schools in Battle Mountain and Austin. The recent increase in gold mining, particularly in the vicinity of Battle Mountain, has made predicting student populations very difficult. As existing mines expand and new mines begin operations, the student population increases throughout the school year. Most of the growth has been in the elementary grades. Table 9 shows the enrollment for Battle Mountain Schools from the 1982-83 school year to 1988-89.

TABLE 9: ENROLLMENT FOR BATTLE MOUNTAIN SCHOOLS, 1982-83 SCHOOL YEAR TO PRESENT

SCHOOL YEAR	Battle Mountain High School(9-12)	Battle Mountain Junior High(6-8)	Mary S. Black YEAR	Eliza Pier High School(9-
1982-83	431*	107**	248	267
1983-84	268	237	210	270
1984-85	240	221	206	257
1985-86	243	209	187	264
1986-87	238	204	206	255
1987-88	234	210	229	246
1988-89	311	235	272	336

* Grades 7-12
** Grade 6 only
Source: State of Nevada, Department of Education

In order to accommodate the growth in student population, a total of nine mobile units (18 classrooms) are currently in use at the school facility. A year-round school program was considered as an alternative to the continued addition of mobile units; however it was deemed economically unfeasible at the time. The only other construction anticipated at this time is a gymnasium for the high school estimated to begin in July 1990.

Faculty hired for the 1989-90 school year include math, science, english, fourth, fifth and sixth grade teachers as well as an additional counselor. A total of ten new teachers have been added so far. Another special education teacher will also been hired through state funding. Fifteen percent of the incoming students require some type of special service. To date teacher recruitment has not been a problem, although a position for a speech therapist did remain open for 6 months.

Student/teacher ratios for elementary, junior high, and high school grade levels were 24.5:1, 26:1, and 20:1 respectively at the end of the 1988-89 school year. The Nevada legislature has mandated that the student teacher ratio for grade 1 be lowered to 15:1 beginning in the 1990-91 school year. The plan calls for carrying this class size over for the two subsequent years to grades 2 and 3. It is believed that maintaining a lower student/teacher ratio for students in grades 1-3 will enable students to develop strong reading and learning skills enabling

The Nevada Highway Patrol has a three-man station housed at the Sheriff's office, and the Austin substation of the Sheriff's Department is staffed by four officers.

The jail facility, located adjacent to the Sheriff's office has a capacity of 18. The average daily population of the facility was 3.7 inmates in 1987 and had risen to nearly 10 inmates in 1988. According to the Sheriff, the largest problem with this increase in inmates is classification. For example, if one prisoner charged with a felony is in the maximum security area (8 person capacity), no prisoners of other classifications may be kept in that area for safety reasons. Thus it is possible to reach "capacity" with less than 18 inmates, a situation that has already occurred at the Lander County facility. At present no plans exist for expansion of the facility.

Medical services in the community are provided by Battle Mountain General Hospital and the Battle Mountain Clinic which is owned by the hospital. In February, all three of the hospital's physicians gave notice of their resignation. One doctor has already left, a second will be leaving at the end of July, and the third in November. The medical staff currently consists of one part-time and one full-time physician, and one part-time and four full-time RN's. As a result of staff shortages, the clinic in Austin has had no doctor since May. The one-day-a-week clinic schedule is expected to resume in August when new staff members arrive.

The hospital has been successful in recruiting two new physicians to take the places of those leaving. The doctors, both from Arizona, have signed letters of intent to begin working at the hospital in mid-August. In the meantime physicians from Reno have been providing care on a locum tenens basis and the hospital has continued to have 24-hour coverage. Recruitment efforts will continue to fill all staff needs.

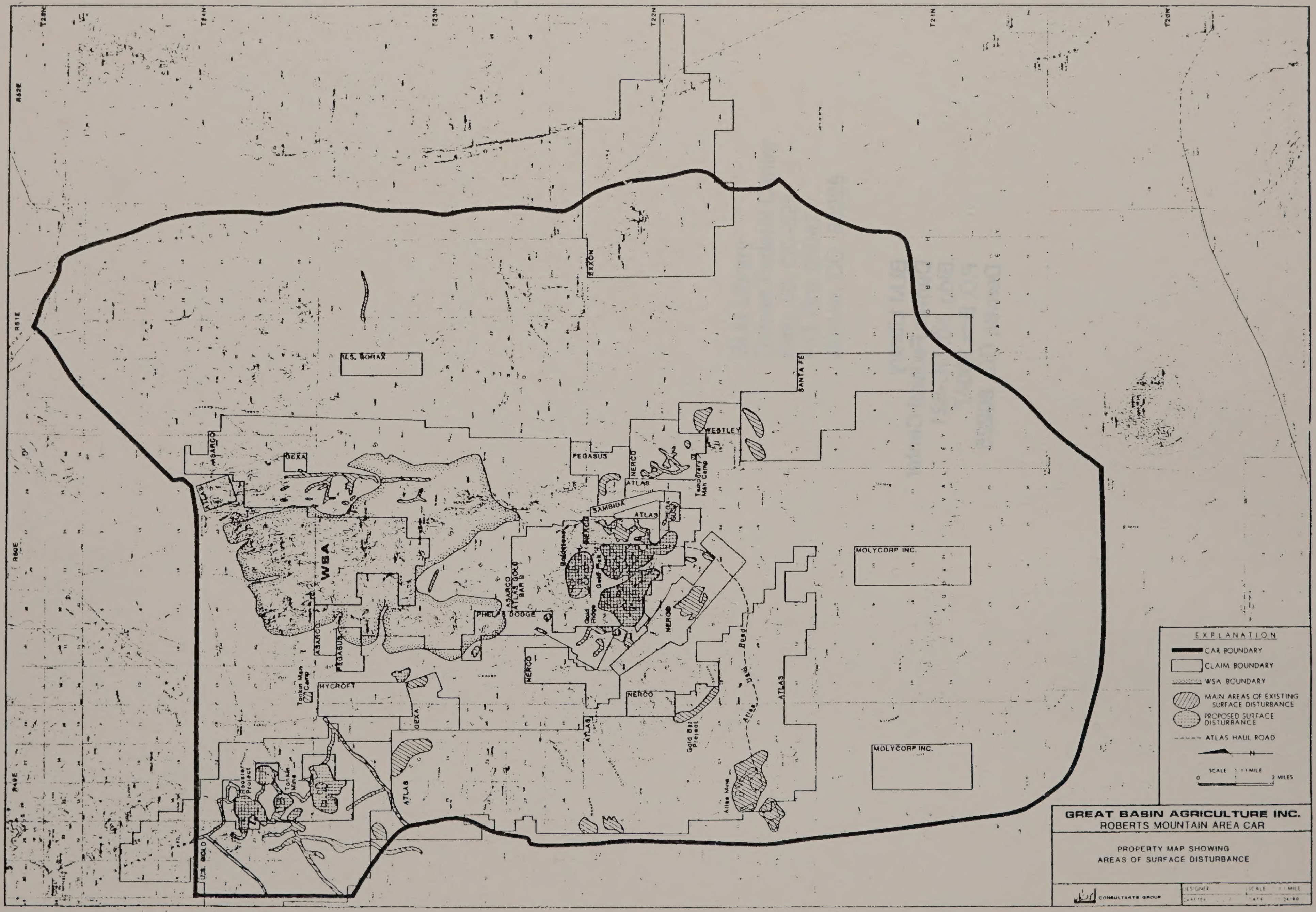
Recruiting staff for rural areas is difficult, and the situation is compounded by the housing shortage. In an attempt to fill physician and RN positions, hospital administration has contracted with recruiting agencies. Full scholarships are also being offered to nursing students who will return to Battle Mountain and work as RNs.

The hospital, built in 1968, has 15 beds and operated at

19.2 percent occupancy in 1988. A recent state inspection of the facility has resulted in the inability to continue obstetric services due to failure to meet physical standards. Hospital administrators plan to appeal the state's decision. Last year about 20 babies were delivered at Battle Mountain General Hospital. Pending renewal of obstetric services, the nearest hospitals able to deliver babies are in Winnemucca, 52 miles west, and Elko, 72 miles east.

The facility is adequate to meet existing and near term needs of routine hospital care. Areas most likely to require expansion are out-patient facilities, administrative space, and possibly the delivery room.

Since the hospital has no major surgical capability, trauma or other severe cases must be transferred to larger facilities in Reno or Elko. Transportation is available by helicopter, plane, or volunteer ambulance as needed.



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AREAS OF SURFACE DISTURBANCE

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